American Machinist

Volume 56 NEW YORK, MARCH 30, 1922 Number 13

Progress in Engineering Standardization

Why This Is the Time to Simplify Designs and Adopt Uniform Methods—Pipe Fittings Interchangeable—Gears and Tolerances Standardized—International Co-operation

By C. W. HAM
Associate Professor of Machine Design, University of Illinois

STANDARDIZATION in the broad sense has for its purpose the quantity production of interchangeable parts for a machine or device. With the old-time methods of producing parts, interchangeability was not an important consideration. The demand for any one class of machines was small and the equipment for manufacture consisted of the ordinary types of machine tools, with only a few of the simplest forms of special tools and fixtures. Parts were assembled into the machine by a slow process involving much fitting, filing, scraping and chipping.

As the demand for machinery of various classes increased, it became imperative to improve production methods. Improvements in the then existing types of machine tools, particularly in milling and grinding practice, advanced at a very rapid rate. New types came into existence, including semi-automatic and full-automatic machines such as the screw machine and turret lathe. Developments in jig, tool and fixture practice followed as a consequence. The question of standardization and interchangeability has been prominent from the begining of the introduction of these modern shop methods.

Standardization in an individual plant depends somewhat on the output. When certain concerns demanded the output of parts in great quantities, they found that, in order to attain and retain manufactory efficiency, it was necessary to standardize their product and install equipment of a highly specialized nature. In the earlier times each manufacturer had his own schedule of sizes, and views as to what should constitute proper standards were widely divergent.

Little progress was made in respect to the interchangeability of products entering into the construction and operation of machinery until movements to that end were undertaken by the great engineering societies. The generally accepted standards now in existence for machine elements are largely due to the efforts of these societies in securing the co-operation of manufacturers in furthering such movements. To give one example of what has been accomplished in this field, it is only in comparatively recent years that engineers and manufacturers have been able to co-operate successfully in establishing standards for pipe and pipe fittings that would be generally acceptable to all concerned. We now have certain generally recognized standards of weights and dimensions for all classes of pipe and pipe fittings, which standards provide an interchangeability that makes it possible to use almost any pipe product on the market that is intended for the same conditions and service, without checking to ascertain if dimensions conform. Investigations of wasteful methods during the war pointed out strikingly the great desirability of further standardizing many kinds of practices and materials. As a result of the close attention that was necessarily given to the problem, considerable progress was made in many industries toward the simplification of designs of manufactured products and the establishment of uniform methods. Efforts to standardize industrial products and practices, however, involve changes which may for a time greatly disturb the operations of a factory system, with a consequent slowing down in production. During the war period most manufacturers were behind in filling orders; competition ceased to be a factor; profits were generous; and the entire country was straining every effort to produce at the greatest possible speed. It is evident, therefore, that that period was not conducive to the launching of any comprehensive scheme of economy. There never was a time, however, when engineers and manufacturers were more forcibly impressed than now with the benefits that would accrue to themselves, as well as their customers, with the adoption of satisfactory standards.

So in the present period of depression in the industrial world, with many plants almost idle, forward-looking executives are finding an unusual opportunity of doing the things that are difficult to accomplish when operating at normal capacity. They are putting their houses in order. Along with the establishment of the latest efficiency methods and systems in the factory, they are giving more attention than ever before to standardization in design. The present situation in the machine tool trade, which may be considered the basic industry, is that the country is stocked up with great quantities of machines, resulting from the intensive

MODERN COMPETITION requires efficient production, which is secured by standardized methods, materials and designs.

Shop operation is simplified, the number of jigs is reduced, stocking of parts in large quantities becomes possible.

The proper use of standards does not curb the designer's initiative, but relieves him of elementary routine work.

The American Engineering Standards Committee is working for national and international standardization.

war-period production. Many concerns will find their only salvation in producing a new and improved line of machines. This affords them an excellent opportunity to start a standardization program, peculiar to their own product at least.

In a manufacturing organization, original designs and changes in design of the product must, of course, originate in the engineering department. In the very nature of things, then, the designer's methods affect the operation of the shop system. If the designers do not have uniform methods and follow certain standard practices, the results are confusion and waste. Without proper standards in design, the best efficiency systems in the shop are futile.

Flexible Standards

Several common misconceptions of standards, although now fast disappearing, have retarded the work in no small degree. The first is that they are final and inflexible, like standards of weights and measures. An engineering standard, whether a particular manufacturer's standard or one universally agreed upon, such as for bolts, nuts and screws, is a thing that is considered, after careful investigation by those best qualified to judge, to be the best for the great bulk of manufacture in the field, in order to facilitate quantity production. Perhaps the argument most frequently advanced against standardization in every field of endeavor is that it impedes individual and engineering progress. Unquestionably it can be overdone.

It is a fundamental policy of responsible organizations, however, not to endeavor to standardize any product that would impede progress in design. Obviously standards should not be promulgated unless there is sufficient evidence to warrant their holding good for a reasonably long period. In the very nature of things they may not be perfect in their original form. Engineering standards should be and are revised when necessary, or discarded altogether. But in an individual plant it is sometimes justifiable to adopt some sort of standard, based on the best experience available, even though it is known at the time that it may have to be changed. It may be a long step toward securing finally satisfactory results.

The proper use of standards does not curb the designer's initiative, as some mistakingly assume. On the contrary, it relieves him of much elementary and routine work, so that his time is given to the larger aspects of his problem. The average designer in a manufacturing plant is necessarily confined to a more or less specialized field. He considers that it is his chief problem to get out a machine that will perform the work required of it. The details are incidental. Hence, widely varying means are used by different designers to perform a common or similar function. Although each may be individually successful, some means are undoubtedly less efficient or more expensive than others. This is not necessarily a fault of the designer. From the very nature of his problem, he may have neither the incentive nor the opportunity to base the design of a detail on all the best available data.

It is the function of the standardizing engineer in the organization to bring together all the best available information on the subject, to get the collective opinion of those in the plant most competent to judge, and after considering it from every angle, adopt for the designer's use that which seems to have the greatest merit Thus in a sense, the design of such details as permit of standardization is the collective work of the entire engineering staff, rather than of an individual. The finished product is improved in quailty, both in detail and as a whole.

Most manufacturing concerns use such universally recognized standard parts as screws, nuts, rivets, studs, and other small parts; but some have only recently awakened to the fact that by proper study given to the standardization of such details of design as flange thicknesses, they could with little effort diminish the number of sizes used, in many cases, by less than half, and at the same time obtain better design. The majority of machine-tool builders are also standardizing their pulleys, handwheels, arbors, spindles, toolholders, etc. The idea is being extended to cover larger and more important components. Machines in general are composed of several mechanisms or unit assemblies, such as indexing mechanisms, reversing mechanisms and change-gear boxes. In many cases these parts can be standardized to the extent that they can be used on several different machines of a similar nature.

The automobile affords a striking example of what has been accomplished along this line. Here it is well known that such unit assemblies as the differential and transmission have been standardized so that they are to a great extent manufactured as specialties by concerns that supply them to manufacturers of many different makes of cars. An individual concern may thus successfully establish standards peculiar to its own product, but obviously can not get results in formulating standards of general interest without co-operation with manufacturers' associations and engineering societies. All such societies have comprehensive programs outlined. What the American Society of Mechanical Engineers and the Society of Automotive Engineers have accomplished is well known. The American Gear Manufacturers' Association is at present conducting a very active campaign for the standardization of gears. The Bureau of Standards has collected data from manufacturers with the veiw of standardizing tolerances.

American Engineering Standards Committee

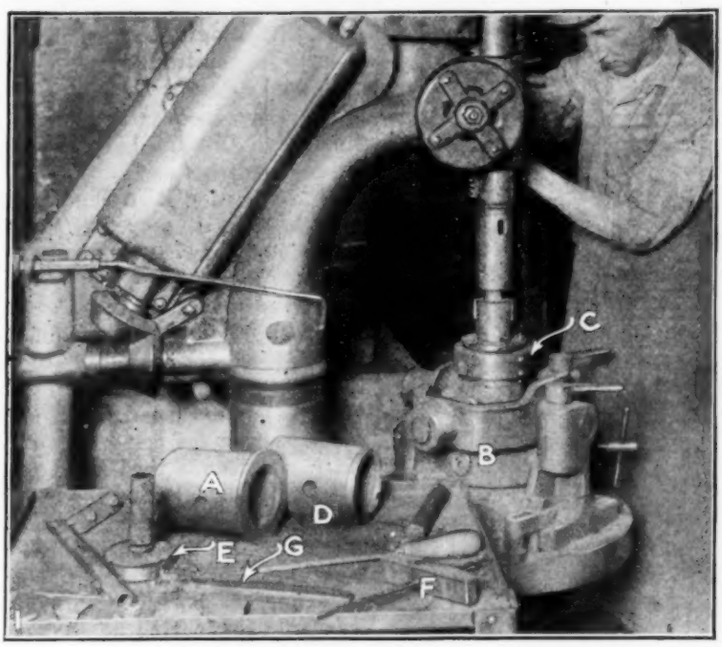
It has long been felt that there is need in this country for something corresponding to the British Engineering Standards Association, to co-operate with similar organizations in other countries and give an international status to approved American engineering standards. After several years of investigation and discussion, the American Engineering Standards Committee has been formed and its constitution adopted by the various engineering societies. Through this new committee, the method of arriving at engineering standards will be unified and simplified. The various engineering societies have direct representation in the committee, and through co-operation, the duplication of standardization will be prevented. Similar organizations are now functioning in several foreign countries, and the American Engineering Standards Committee is in active co-operation with them. Some of its latest activities are co-operation with the Canadians on bridge specifications, with the British on specifications for machine tools, with the Swiss on ball bearings, and with many of our own societies on industrial safety codes. The American Engineering Standards Committee will act as a bureau of information regarding standardization in general. It will collect information regarding existing standards, co-operate in their revision, and give valuable advice and assistance to those who wish to formulate new standards.

Making Pistons for the Mack Motor

Casting a Header to Insure Solid Metal—Fixtures and Tools Used for Machining—Ring Grooves Finished by Hardened Steel Rollers

By FRED. H. COLVIN
Editor, AMERICAN MACHINIST

THE pistons for the Mack Motor are cast with a flange as shown at *A*, Fig. 1, which acts as a riser for clearing the skirt of impurities and also tends to prevent distortion in casting. The bosses are cored as shown. The first operation is to bore and face the open end but instead of doing this in a lathe as is usual, it is done in a Barnes drilling machine, using a special chuck and boring tool. The holder is shown at *B*, the boring and facing tool at *C*, while *D* shows the piston after the operation. The piston is gaged for diameter by the plug *E* and for depth by the gage *F*. securing uniform depth inside the piston it is easy to maintain the desired thickness of the piston head. Details of the centering device and holding fixture are shown in Figs. 2 and 3.



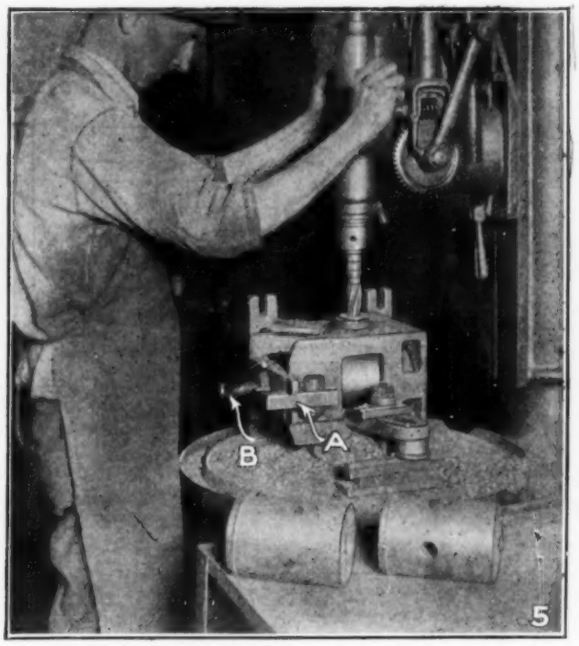


FIG. 1. BORING AND FACING OPEN END. FIG. 5. DRILLING PISTON-PIN HOLE

The details of this holder and of the operation are interesting as the design and the method are both unusual. The piston is first centered from the inside by the expanding mandrel shown in Fig. 2, which consists of a spool with flattened sides to slip past the piston pin bosses, and two sets of centering fingers *A* and *B*. There are 4 fingers in the lower set and 3 in the upper.

With the nut *C* loosened to allow the fingers to recede, the mandrel is slipped into the piston. Then the fingers are expanded by tightening the nut *C* with the wrench *G*, Fig. 1, which draws the cones at the end together and forces the fingers out against the inside of the piston. The piston is then put in the fixture, Fig. 3, which is provided with double trunnions or gimbals to allow the piston to center itself regardless of the outside shape. It can be clamped by tightening both trunnions if desired but the usual plan is to allow it to float at will without fastening. The piston is centered by slipping the guide on the upper end of the mandrel up into the center of the turning and boring tool, then adjusting the fixture to it.

The piston rests on the four studs *A* and is clamped at the bottom by the screw *B*. This, with the serrated jaws *C* and *D*, gives a 3-point hold on the piston.

The boring and facing tool, Fig. 4, consists of a shank *A*, with an inner head *B*, with openings for the cutters as shown in the end view. Inside of this is a spool *C*, which acts as a central support for the boring tools for the end of the skirt. This spool also has a hole for guiding the centering mandrel. The boring tools are seen at *D* and *E*, the first being the roughing and the latter the finishing tool. The facing tool is seen at *F*, while other tools trim off the outside of the flange.

The piston-pin holes are then bored in the fixture shown in Fig. 5. This fixture has a latch *A*, for quick action, the screws *B* tightening the piston into place. Then comes the rough-turning on a Potter & Johnston automatic lathe as in Fig. 6. Here the front cross-slide carriage has been removed and a special tool carriage *A*, put in its place, the carriage support bridging the cross-slide. This carriage is moved by the bar *B*, utilizing the turret-slide feed for the purpose. At the same time the back cross-slide carriage faces the end of the piston as at *C*. Details of this carriage are shown in Fig. 7. A similar attachment can be made for other uses where it is desired to have a longitudinal

feed near the nose of the spindle. The supporting bridge is shown at *A*, while *B* gives the end view and shows the carriage *C* with its tools and their adjustments.

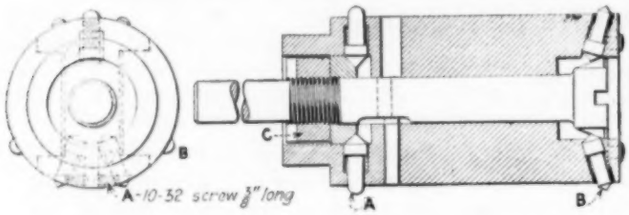


FIG. 2. MANDREL FOR CENTERING PISTON

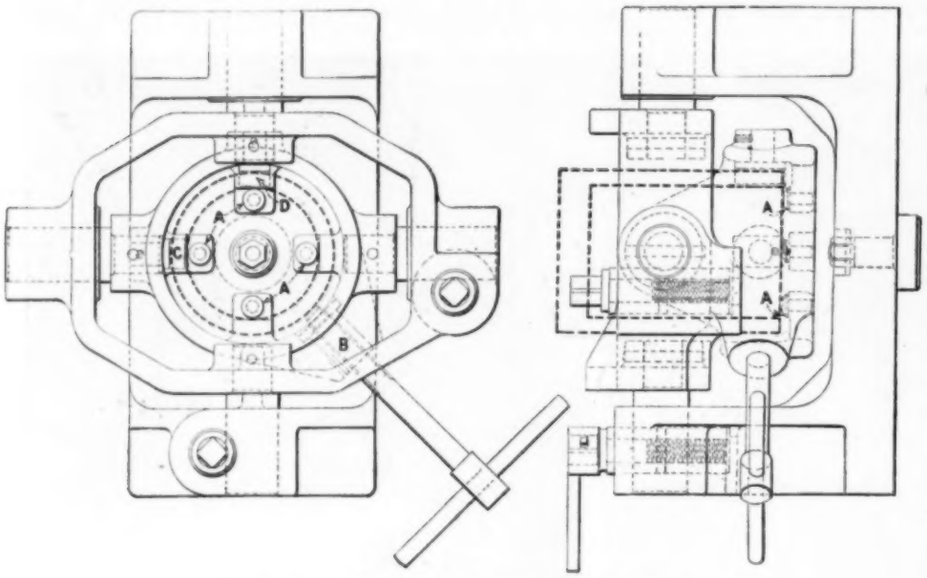


FIG. 3. FIXTURE FOR HOLDING PISTON

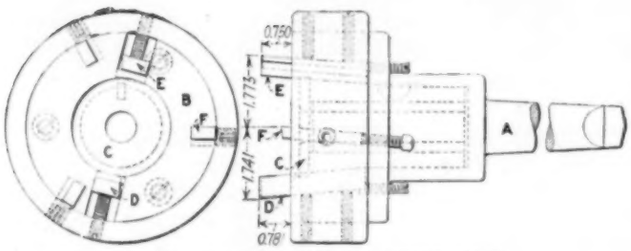


FIG. 4. BORING AND FACING TOOL

The plan view gives all the other information necessary. The pistons are then heat-treated to remove stresses of all kinds.

Another special Potter & Johnston set-up is shown in Fig. 8. This centers the end, finish-turns the outside, and grooves for the piston rings as well as turns the oil relief over the piston-pin holes. The piston is held by a draw-back pin with air chuck control. The springs shown in front at *A*, are to return the relief tools to their cut after being moved out by the cam *B*. The guide roller is at *C*. This cut relieves the sides of the piston over the ends of the pin, in the usual manner.

Details of the relief turning fixture are shown in Fig. 9. The cam *A*, works against the roll *B*, which is kept in contact by the springs *C*. This cam moves the relief tool in the cross-slide, which receives its longitudinal movement from the turret slide by means of a bar at *D*.

The ring grooves are then finished to size and burnished by rolling tools of hardened steel as shown at *A* in Fig. 10. The piston is supported at the outer end by the center during this operation.

The taper is then ground on the head end of the piston, followed by the grinding of the skirt and the finish-facing of the piston head. Then comes the finish-facing of the skirt end and the boring, reaming and facing of the inside of the piston bosses. These operations are done in the fixture shown in Fig. 11. The piston is held by the clamp *A* and the boring bars are piloted by an inner bushing, while the floating bushings *B* and *C* fit into the outer end of the chuck and so the bars are guided at both ends.

The inner ends of the bosses are faced by a special tool which is shown in position at *D*. It has a cross-slide and carries the tool shown in detail in Fig. 12. This tool consists of a bar *A*, turned eccentrically at its outer end except for the portion at *B* to support the cutters *C*. The portion *B* is flattened on the sides

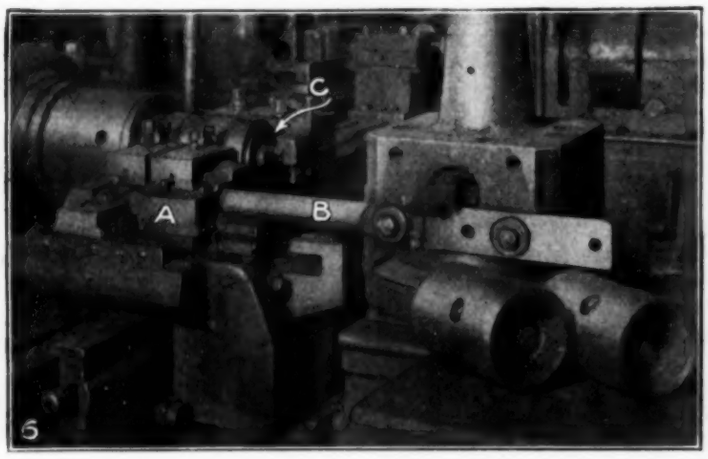


FIG. 6. ROUGH-TURNING AND FACING.

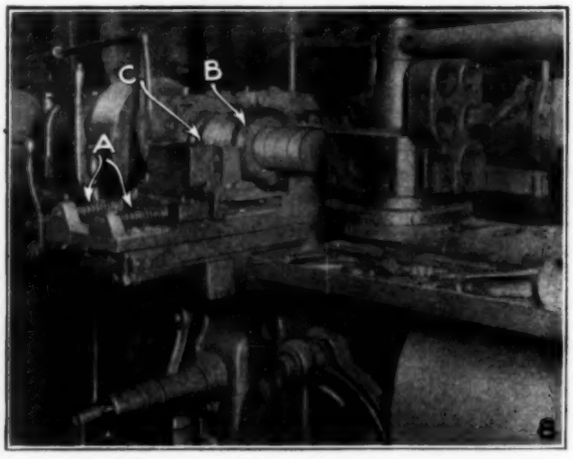


FIG. 8. FINISH-TURNING AND GROOVING

as at *D*. As can be seen the cutters can pass through the hole in the piston and, when the bar is in its proper location, it is fed by the slide shown at *D* in Fig. 11, and the inside of the bosses faced to the desired width. The cutters are positioned and held from turning by setscrews at *E*, Fig. 12, while they can be adjusted, after grinding, by the screws *F*. These cutters face the bosses and leave a fillet next to the piston-pin hole.

The oil holes are then drilled in the bosses and oil grooves cut by the fixture shown in Fig. 13. Then the piston is finish-reamed in the machine shown in Fig. 14. Here the piston is clamped very lightly in the V-shaped block at *A*, and located by the end piece *B*, while the clamp *C* holds it for reaming. The dial indi-

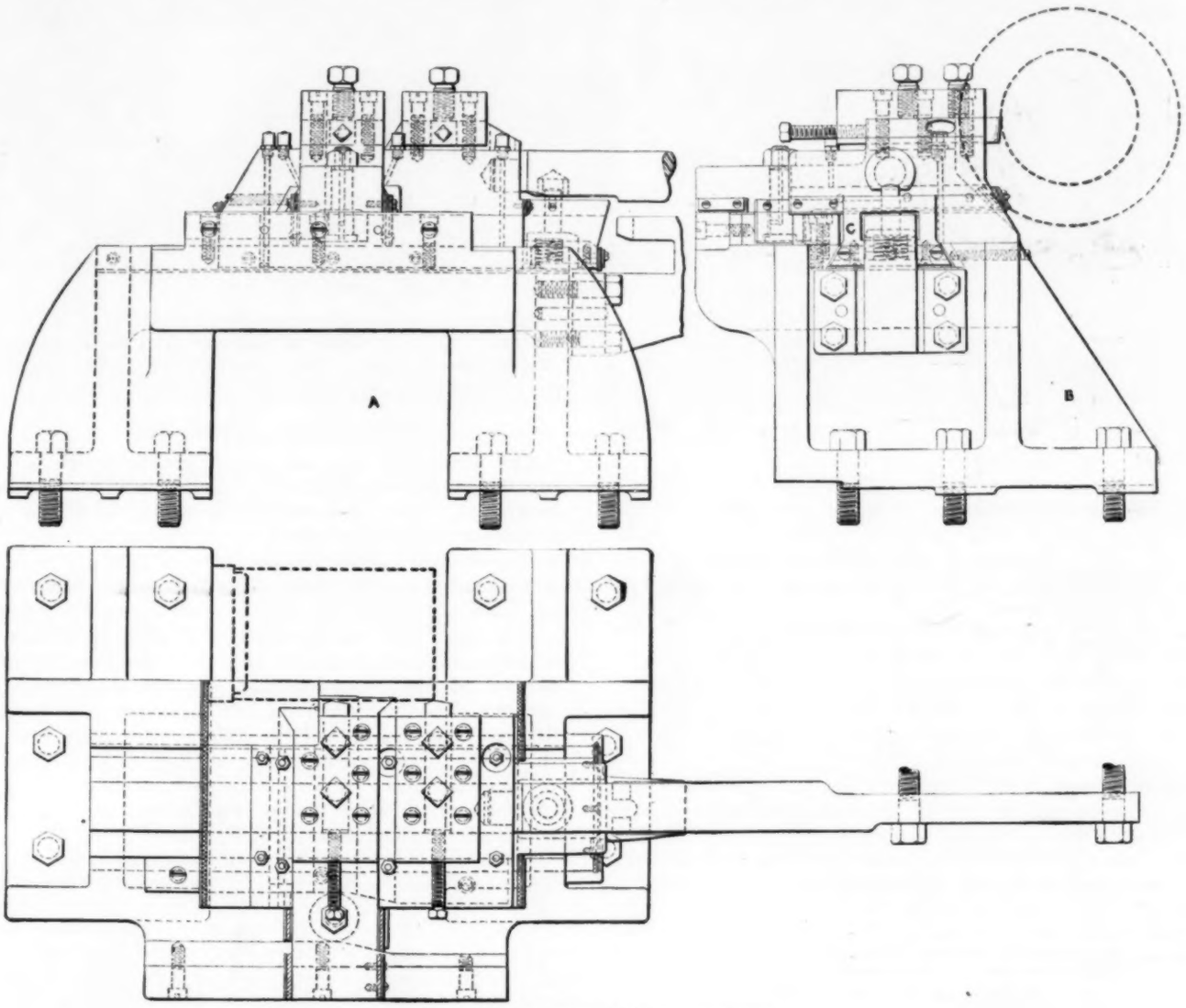


FIG. 7. TOOL FOR ROUGH-TURNING

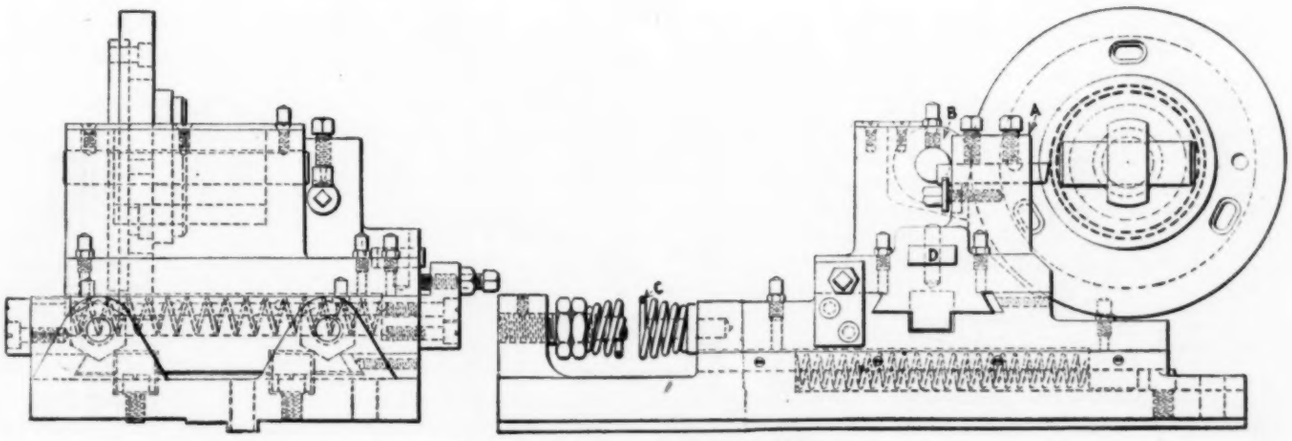
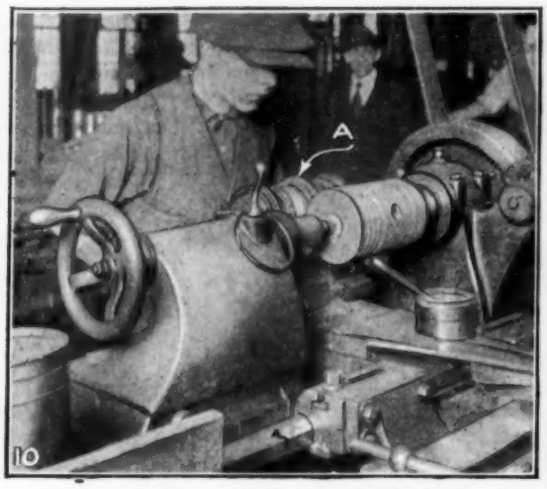


FIG. 9. DETAILS OF RELIEVING TOOL



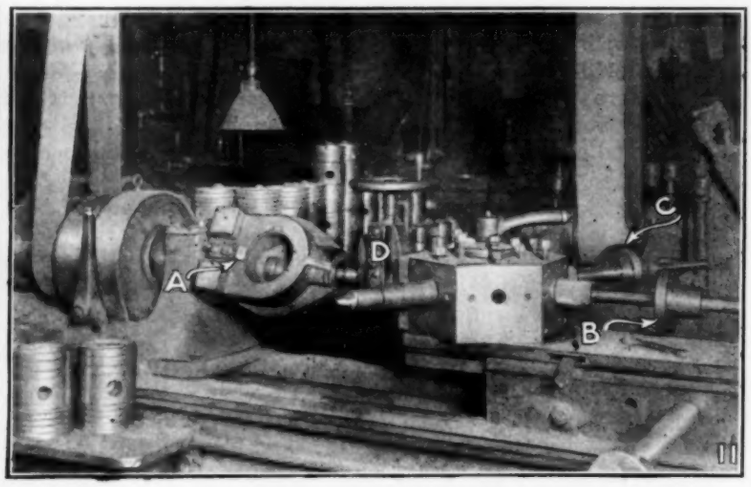


FIG. 10. BURNISHING THE GROOVES. FIG. 11. BORING PISTON-PIN HOLE

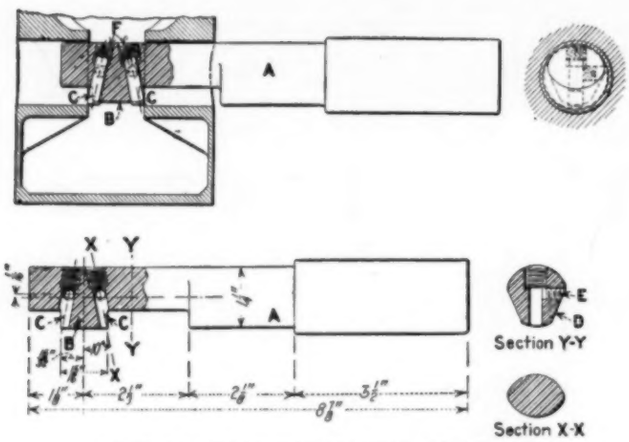


FIG. 12. TOOL FOR FACING BOSSES

cator shown at *D* is used to test the squareness of the piston in the fixture. In this way the trouble of having pistons out of square is avoided.

The inspection is very thorough, the standard diameter gage at *A*, Fig. 15, and the dial gage at *B* with its contact point at *C* show the diameter and the roundness. Pistons are weighed for selection into sets, and the sub-assembly is also weighed.

Grooving the Piston Boss

The piston-pin boss has an oil groove which is cut in a very ingenious manner, in the special fixture shown in Fig. 13. This holds the piston by the head and the bottom of the skirt as shown by the dotted outline. The boring bar carries two grooving tools *A* and *B*, and it will be noted that the boring bar is not concentric with the piston-pin hole, but about $\frac{1}{8}$ in. below the center.

The large part of the bar has a guiding groove *C*, which terminates in a cam *D*, at the end, the straight portion of the groove holding the cutters uppermost and out of contact when the bar is pushed in and withdrawn. The pin *E*, with a roller on the end, acts as the guide. This pin has to be withdrawn and inserted at each operation, but in future bars the groove will be extended to the small part of the bar so that it may be entered and withdrawn without removing the pin.

With the cutting tools at the top and clearing the piston-pin bore, a half turn of the handle rotates the

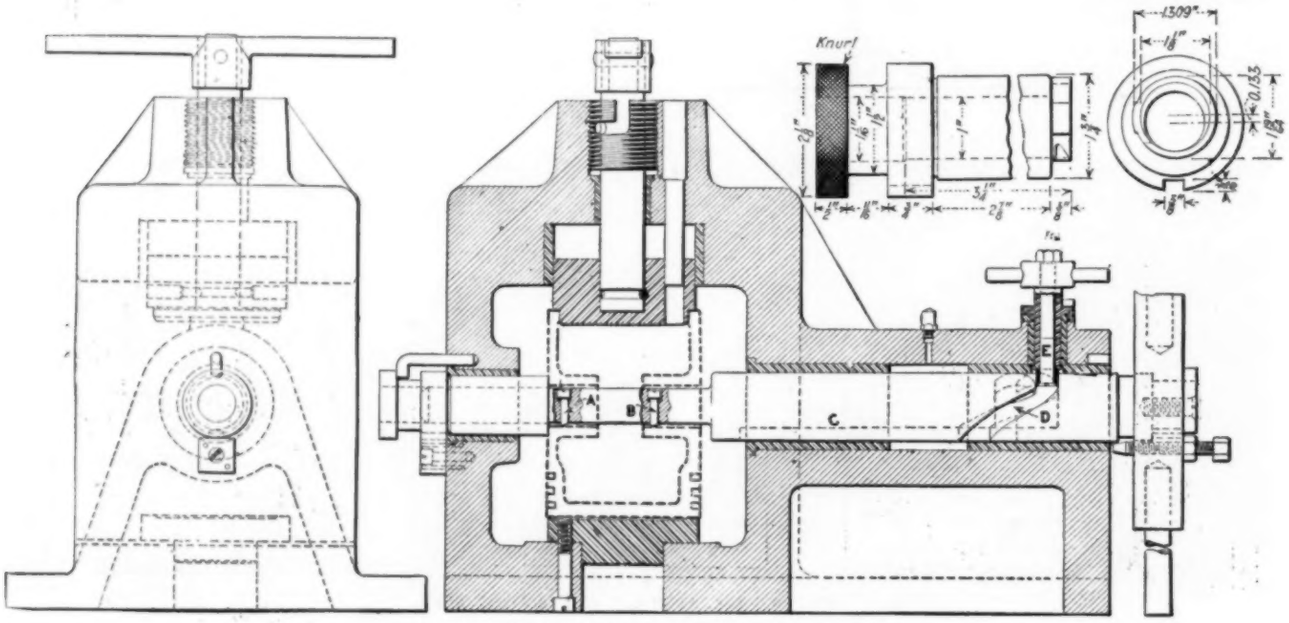


FIG. 13. FIXTURE FOR CUTTING OIL GROOVES

FIG. 14. FINISH-REAMING THE PISTON. FIG. 15. INSPECTING PISTONS

bar in the path of the cam groove *D*. This swings the cutters down into the lower half of the hole and at the same time advances the tool so as to cut an angular groove which runs out at each end. This makes a good oil groove and one which is uniform in all pistons. The production is very satisfactory but a future machine, or fixture, will be arranged for power drive.

Cold-Headed Bolts

By V. E. Hillman
Metallurgist, Crompton & Knowles Loom Works

The term "cold work" implies that energy is expended on the metal when its temperature is below the critical range. The microstructure of the metal prior to the application of cold work consists of an aggregate of crystalline grains or cells, each grain being a structural unit. It may suffer rupture or deformation; it may be enlarged, elongated, stressed, or restored to its normal size and shape. When the metal is subjected to mechanical pressure, the crystals are crushed and intimately mixed. Cold work has an embrittling effect upon the metal and the grains which were originally equiaxed or elongated, assume a ropy appearance resembling fiber. In brief, the grains lose their original identity.

There is a limit to the amount of cold work which a piece of steel will sustain. Therefore, the cold working of the metal must be interrupted from time to time to relieve the internal stresses which have been developed. In other words, if the strained steel be heated to above its critical range, for 15 min. at 1,650 deg. F., and quenched, the elongated grain fibers will be effaced and renewed toughness will be conferred on the metal. A lower annealing temperature, 1,150 deg. F., for one hour will also suffice to remove, partially at least, the embrittling effect of cold work. It should be borne in mind, however, that only the strained ferrite grains are influenced by the lower annealing temperature.

Soft basic steel is well adapted for the cold heading process. The carbon content in the metal, however, should be regulated carefully. It is a well-recognized fact that if an attempt be made to upset a piece of high carbon stock, the steel will simply bend over, whereas material of the proper analysis, 0.10 to 0.20 per cent carbon, will flow readily into a compact mass.

There is a limit to the volume of metal that can be fabricated into the head of a bolt. The maximum length of stock that can be formed into the head is equivalent to seven times the diameter of the rod which is being upset. That is to say, if the diameter of the rod be ¼ in. then it is possible to crush 1¾ linear inches into the head. These tolerances should be followed if "cold shuts" are to be the exception and not the rule.

The reliability of a cold-headed bolt is dependent upon the number of blows it received during the fabrication process. The limit of stock which can be compressed into the head by a single blow is two and one-half times the diameter of the rod. Cold-headed bolts of commerce are generally subjected to two or three blows. However, there are instances where four, five and six blows are required to effect a reliable upset.

Importance of Annealing

Conclusions: Various degrees of distortion may be found in the same bolt. Certain regions undergo slight deformation, whereas other sections undergo extreme distortion.

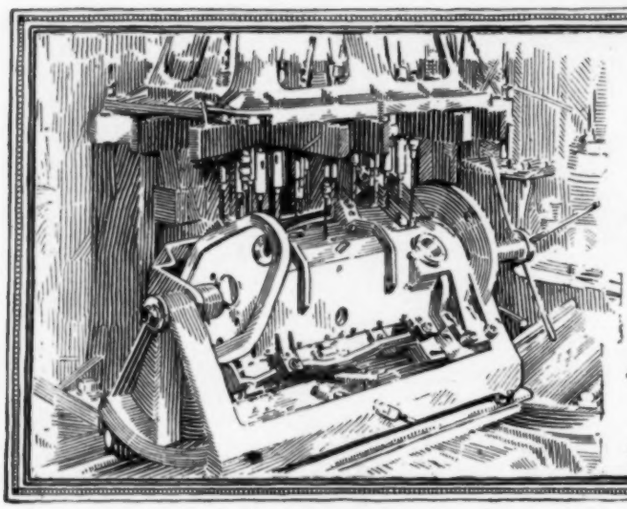
Annealing at 1,150 deg. F. will remove the weakening effects of cold work. Irrespective of the degree of cold work, crystallization will not take place below 1,280 or above 1,380 deg. F. If the temperature of the furnace reaches the hazardous zone, 1,280 to 1,380 deg. F., crystallization will take place only in those areas which have been slightly strained.

Annealing above the critical range 1,650 deg. F. is preferable.

In this range of temperature, 1,625 to 1,675 deg. F., and regardless of the degree of strain, crystallization will not result.

The successful manufacture of cold-headed bolts demands the application of fundamental metallurgical principles. The quality and service of the finished product is therefore dependent upon an adherence to the laws of metallurgy.

Abstract of paper presented before the American Society for Steel Treating.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Cross-slide Toolholders for Turret Lathes Continued—Cutting-off and Formed Tools —Circular Forming Tools—Over-shot Tools—Turret Toolposts

IN THE design of parting or cutting-off tools it is particularly important to make the holder in such a way that there will be no opportunity for movement of the tool during the operation. Parting tools

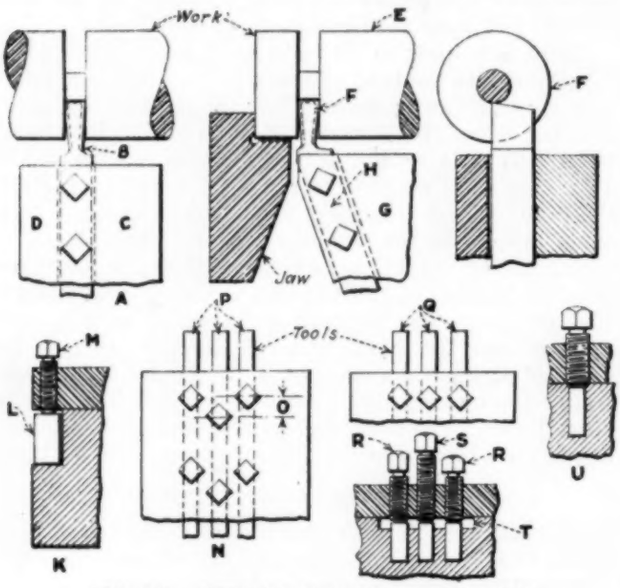


FIG. 347. DETAILS OF TOOLBLOCKS FOR PARTING TOOLS

are usually relieved on the sides, as otherwise they are likely to rub and tear the side of the groove and leave a ragged surface. A grooving or parting cut is one of the most difficult, particularly when the groove is deep and narrow, as shown in the detail *A*, Fig. 347. The type of tool often used for this purpose is shown at *B*. It is held in a slot in a holder *C* by means of two square-head setscrews. A tool of this kind should be made as deep as consistent with the nature of the work which is being cut, as the pressure upon it is excessive, and it is likely to break when the cut is very deep.

When grooving tools are made, if the groove is to be held closely to width and is rather deep, it is generally necessary to use roughing and finishing tools, the finishing tool not being back tapered, but having a slight amount of clearance on the sides. As the finishing tool has very little work to do, the width of the slot can be easily preserved. For very wide and somewhat deep grooves, it is advisable to do the sizing for width with two tools, so made that they can be adjusted to compensate for any errors in grinding on the sides.

In the toolholder shown at *C*, the slot for the tool is cut in the body and there is a projecting portion at *D* which prevents working close to a shoulder or to chuck jaws. In many cases this would not be a good holder to use, for the reason stated. There are two ways of avoiding any such condition; one of them being shown at *H*. The work *E* is held in chuck jaws, so that there is not much space for any projection like that at *D*, beyond the tool. Hence, a bent tool like that at *F* can be held in a holder *G*. The slot which contains the tool is open on the side, thus allowing the cutter to work close up to the chuck jaw without interference.

Another way is to make the toolholder straight, but open on one side; and this method is probably better than that shown, as there is less trouble in setting the tool and less work in making the holder. The illustration at *K* shows the tool *L* held in an open-side holder by means of the setscrew at *M*. This method is used

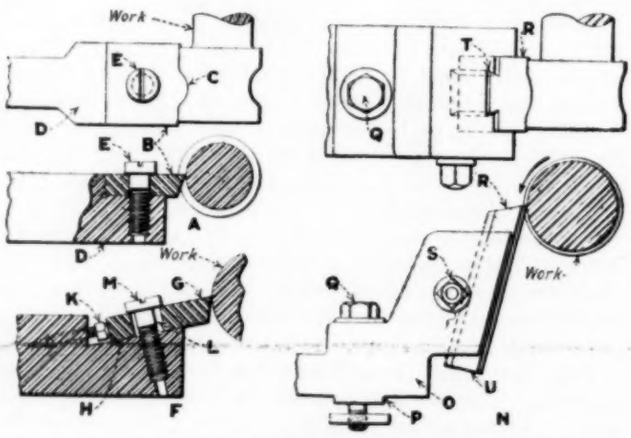


FIG. 348. FLAT-BLADE AND DOVETAIL FORMING TOOLS

For the authors' forthcoming book. All rights reserved.

where tools must be set to operate close to a shoulder.

When several narrow tools are used close together for grooving, as shown at *N*, it may be found difficult to locate the holding-down screws so that they will be easily accessible. The three tools *P* illustrate this point very well, and the method of staggering the setscrews is clearly shown. By making the distance *O* sufficient, so that the operator can place a wrench on the various setscrew heads, no difficulty will be experienced. This method is objectionable because the screws are sometimes placed too far back from the end of the tool, and therefore do not hold it as firmly as is needed. In the example *Q* the three tools are held by three setscrews placed in line with each other, but the screw *S* is higher than those marked *R*. The operator can therefore easily use a wrench on any one of them without interference.

The caution is here given to avoid the use of holding-down screws of too small a diameter. Many designers make errors of this sort due to a lack of thought. In holding narrow tools like that shown at *U*, it would appear that the largest setscrew which could be used would be one which is no larger than the width of the slot. Yet, if the toolblock is relieved, as shown at *T*,

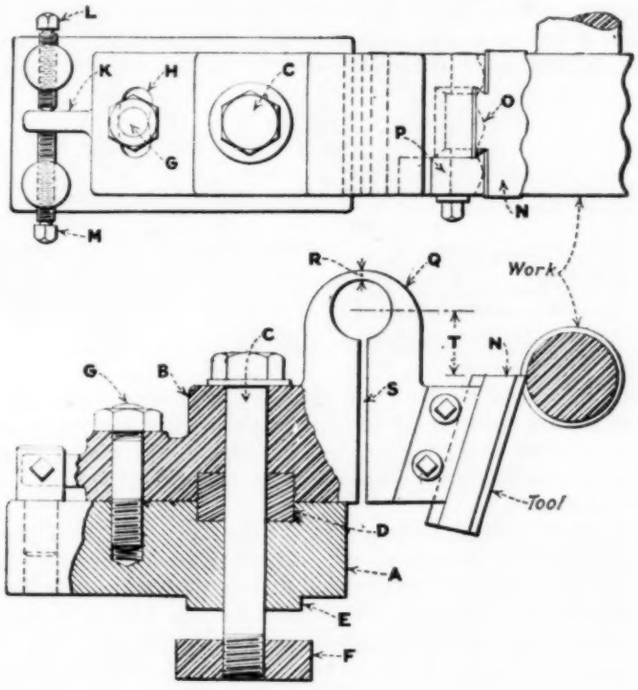


FIG. 349. GOOSE-NECK HOLDER FOR FORMING TOOLS

and the tools project slightly above the relieved surface, the setscrews can be larger than the width of the slot and thus have greater holding power. An advantage in using the setscrews is that they are less likely to be broken or mutilated when in use. This is particularly noticeable when small headless setscrews are used. It is advisable to avoid this type of screw for any holding-down operations, as the slots are likely to become broken so that they are useless.

In making a formed cut, a tool can be made having a contour of the correct shape so that it will reproduce this shape on the work. When the form is simple and does not require to be held very accurately, a flat-blade cutter can be utilized and very good results obtained. If it is necessary to make the form to an accurate size, other methods are to be preferred. Fig. 348 shows at *A* a flat-blade forming cutter *B* designed for the purpose of cutting the form *C*. The cutter blade is ground

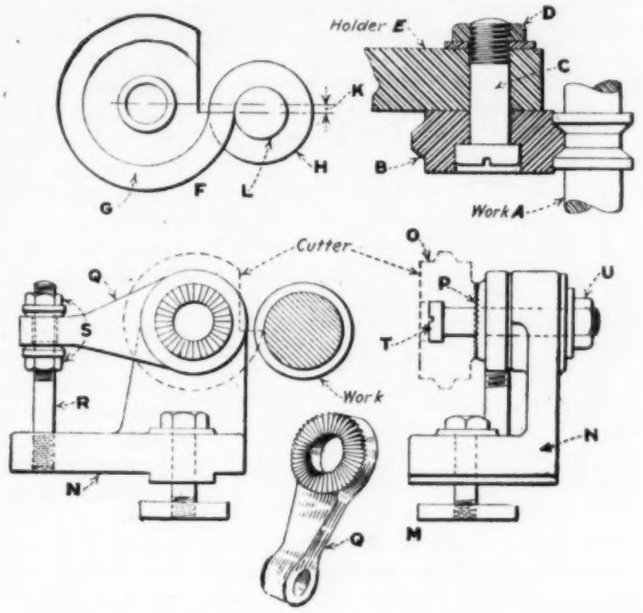


FIG. 350. CIRCULAR FORMING TOOLS

to the required shape, and it is held in a shank *D* by means of a screw *E*. It is backed up against the shoulder on the holder, as indicated. This holder may be used in a standard toolpost or in a toolblock, the shank being proportioned to suit the conditions. For simple work and production which is not very high, this device will give fairly good results.

Another example of a somewhat similar tool is shown at *F*. The blade *G* is set at an angle and is held against an angular surface *H* and backed up by a setscrew *K*. The slot *L* allows the tool to be adjusted slightly, and after this adjustment has been made the special screw *M* is tightened, thus holding it firmly. For steel work when a little shear is required to produce a smooth cutting action, a holder of this general type can be used. It is advisable, however, in the majority of cases to do away with the adjustable feature and bring the back of the plate solidly against the holder. All necessary adjustments can then be made by an adjustment of the cross-slide or the holder in the toolblock.

Another type of tool frequently used for forming is the dovetail forming tool shown at *N*. The toolblock *O* is designed to fit the cross-slide of the machine, and is located on it by means of the tongue at *P*. It is held in place on the slide by one or more bolts *Q*. The tool *R* is somewhat different from others which have been described. It is a long piece of tool steel, dovetailed at *T* to fit the holder. It is clamped in the dovetail by means of one or more bolts *S*, these being arranged so that they bear directly against the dovetailed surface.

Several methods of holding are in vogue, but hook bolts cut out to fit the dovetail will usually give very good results. Sometimes the "pinch-binder" principle is used, the holder being split in the middle and drawn up tightly on the dovetail by means of a couple of bolts. Forming tools of this kind often require support at the point *U* when the cut is very heavy, as otherwise they are likely to slip and change their position with respect to the center of the work. The holder can be

designed so that a backing-up screw may be placed at this point if desired.

In order to avoid chatter under heavy forming cuts, the "gooseneck" principle can be applied to the toolholder. On some kinds of forming cuts it is very difficult to obtain a smooth surface free from chatter marks, but this trouble can be avoided by the use of a holder like that shown in Fig. 349. The block *A* fits the cross-slide T-slot at *E*. Mounted on this block is a swivel member *B* which pivots on the hardened locating ring *D*. The block is held down by the bolt *C*, which draws up on the shoe *F* in the T-slot of the cross-slide, thus holding the entire unit down firmly. The provision for side adjustment is made in the slot *H*, the binder stud *G* being provided with a nut to make the unit secure after it has been adjusted.

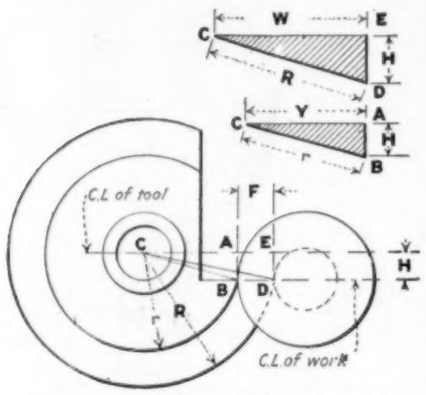


FIG. 351. LAYOUT FOR CIRCULAR FORMING TOOL

The member *B* has a "tail" *K*, which is held between two setscrews *L* and *M*. These two screws can be used to control the position of the swiveling member. The other end of the holder is drilled at *Q* and slotted at *S*, and the portion *R* is left rather thin so as to permit it to spring easily. The tool *N* is fitted to a dovetail at *O*, and is clamped in place by means of a shoe *P*, which fits one side of the dovetail. The distance from the top of the cutter blade to the center of the hole, as indicated at *T*, should be sufficient to allow the movement or deflection of the tool to carry it well away from the work, so that it will not dig in or chatter.

Attention should be paid to the thickness of the wall at *R*, as upon this depends the amount of spring in the tool. It should be thick enough to stand the stresses imposed by the cut, and thin enough so that it will spring readily. The member *B* should be made of tool steel hardened and spring tempered at *R*. It is usually necessary to place a flat spring in the slot *S* in order to prevent too much vibration under the cut. This spring can be adjusted up or down in the slot as may be desired. Tools of this general type are useful not only for forming cuts, but for threading or work of like character. In fact, for any severe cutting which is likely to produce chatter, a tool of this kind is an effective remedy.

Circular Forming Tools

Another type of tool very useful for forming cuts is the circular forming tool. Two examples of this sort of tool are shown in Fig. 350. The work *A* is to be formed by a cutter *B* held in place in the holder *E* by a special screw *C*. This cutter can be adjusted by loosening the nut *D* and turning the cutter around to the position required. In order to illustrate the cutting action of the forming tool, a diagram is shown at *F*. Here the tool *G* represents the circular forming tool and *H* shows the work.

The position of the cutting edge of the formed tool is below the center of the tool but on the center of the work. In other words, the forming tool is sharpened considerably below its own center. The designer will note that the terms above and below depend upon whether the tool is applied to the front or rear of the cross-slide. In the former case the cutting edge would be below center, while in the latter it would be above center, because the tool would be inverted. In either case, however, the cutting edge would be on the center of the work. This vertical distance between the centers

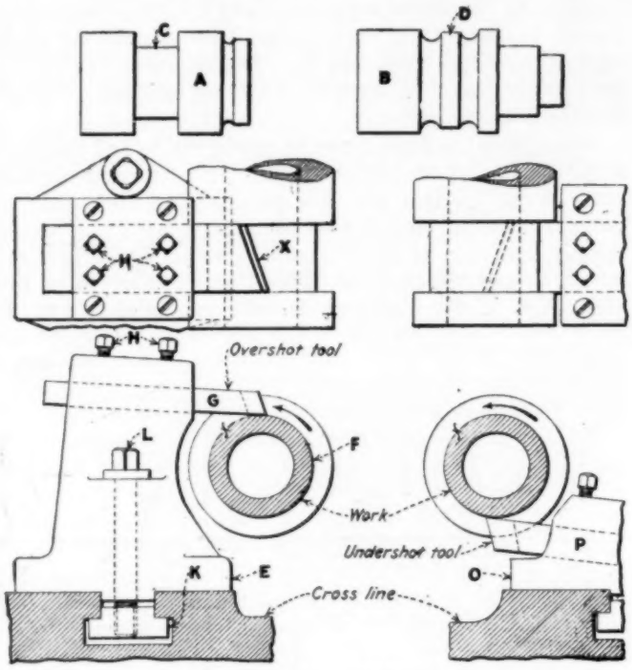


FIG. 352. OVERSHOT AND UNDERSHOT TOOLS

is indicated at *K*. The purpose of cutting the tool below its own center is to provide greater clearance at *L*, so that there will be less likelihood of the tool rubbing and losing its edge due to an insufficient amount of clearance.

An improved form of toolholder for circular forming tools is shown at *M*. The holder *N* is attached to the cross-slide in the usual manner by means of a bolt and shoe. The cutter *O* shown by the dotted line, is drawn back against a serrated member *P*, and held in place by means of the screw *T* drawn up solidly by the nut *U*. In order to provide a means of accurate setting after grinding, the arm *Q* is mounted in such a way that the two nuts at *S* can be adjusted up and down on the stud *R*, which is placed in the body of the fixture. As the side of the forming tool is serrated to correspond with the teeth on the arm, the adjustment of the tool can be very easily made. The arm is shown in detail at *Q* in order to make the matter somewhat clearer. This type of circular forming tool has met with great favor, and it is in common use throughout the country.

Due to the fact that a forming tool has its cutting edge below its own center, it is evident that the radial length of the shoulder or steps on the tool must be less than the actual shoulder to be formed on the work. For tools which have no rake, simple formulas will enable the designer to figure the required diameters without difficulty. When the cutting edge, however, must be

made with more or less rake, other formulas must be used. In order to avoid complications on the matter, we shall concern ourselves only with the simple type of circular forming tool, a diagram to illustrate which is shown in Fig. 351. Referring to the diagram, the various formulas given here will be readily understood.

In order to find the diameter of circular forming tools it is first necessary to find the value of W in the right triangle DEC, or

$$W = \sqrt{R^2 - H^2}$$

In this equation,

R = Radius of largest diameter cutter.

H = The distance above or below center of work that the center of tool is set.

In order to find the value of r in the right triangle ABC,

$$r = \sqrt{Y^2 - H^2}$$

In this equation,

$2r$ = Small diameter of cutter.

$Y = W - F$.

F = Half the difference between the circular diameters of the work.

In connection with forming cuts of various kinds, it is necessary to mention a type of tool which is not in very common use, yet which has a number of advantages. Referring to Fig. 352, two pieces of work are shown at A and B; in one of these a deep groove is cut at C while in the other case a form cut is made at D. Either of these two jobs can be done with a circular or dovetail forming tool. The cutting action, however, in either case is rather severe, especially if the work is of large size.

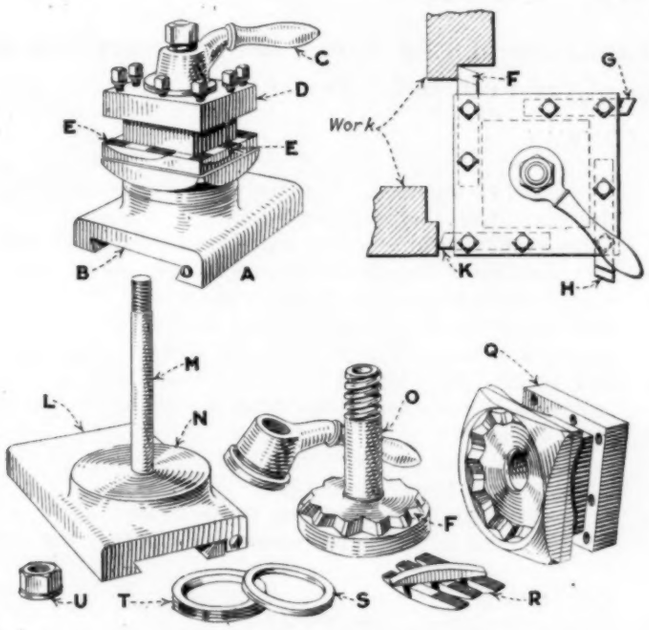


FIG. 353. TURRET TOOLPOST FOR CROSS-SLIDE

A type of tool which will give good results for work of this character is shown at E and is designated as an overshot tool. The toolblock is fitted to the cross-slide of the machine and is held firmly in place by means of the bolts L which draw up on the shoes K. The tool G is set so that it overhangs the work and so that it is more or less tangent to it when the full depth of the cut has been reached. The tool is held by means of four setscrews at H, and it is set at a slight angle in order to provide clearance. The front of the tool is also cut at an angle, as shown at X.

It is evident that when the cross-slide feed is started, the tool will be fed inward toward the center of the work and that there will be a shearing action caused by the angular surface X, so that the chips will roll up and part from the metal with a minimum amount of friction. An advantage of this type of tool is that the diameter of the work can be held very accurately. A principle similar to this is used in universal turning tools for steel, and it may be here stated that this type of tool is more adapted to steel than it is to cast iron. The tool can be formed to any shape desired, and as it needs to be ground only against the angular surface X, it will hold its shape without difficulty.

Another type of tool employing a similar principle is shown at P. It is called an undershot tool and is placed at the rear of the cross-slide in a holder similar to that shown at O. This type is not as common as the other, and it is ordinarily not considered as good. If the cross-slide gibbing is slightly loose, there is inclined to be a lifting action on the tool which tends to produce chatter. For certain kinds of work, however, it may be found useful.

Turret Toolposts

Work which requires several shoulders to be turned or sized may oftentimes be handled to advantage by means of a turret toolpost such as that shown in Fig. 353. The assembly shown at A gives a very good general idea of the device. It is intended to be fitted by means of a dovetail B to the cross-slide of the lathe. The body of the tool D is arranged so that it can be indexed into a number of positions and clamped in place by means of the binder handle C. The tools are held on

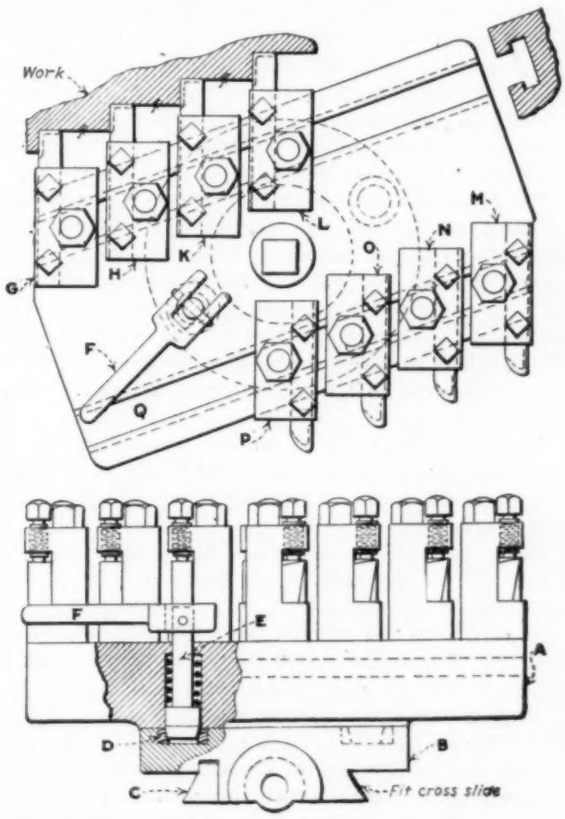


FIG. 354. SHOULDER TOOL SET-UP ON TURRET TOOLPOST

the hardened rockers E, and firmly secured by means of the setscrews at the top of the turret. The rockers permit a certain amount of adjustment to the tools, so that slight inaccuracies in grinding can be compensated. The tools F, G, H and K are shown in the turret toolpost, and their application to the work can be readily seen by reference to the illustration. Two diameters are turned, roughed and finished without changing the position of the cross-slide after the tools have been set.

The base of the toolpost L has a circular pad on it at N, in the center of which the stud M is fixed. On this stud the quill O is located, and at the lower end of the quill indexing teeth are cut as shown at P. The turret body Q is mounted on the quill, and indexing is accomplished by loosening the binder handle and moving the turret around to engage with the various teeth shown. Other details are clearly shown at R, S, T and U. Turrets of this sort are very useful in manufacturing for either high or low production.

Another type of cross-slide turret toolpost is shown in Fig. 354. This example illustrates the possibilities of multiple cutting tools for shoulder work in connection with a turret-indexing device on the cross-slide. The indexing portion A is mounted on a base B which is fitted to the cross-slide and gibbed by means of the dovetail gib C. The indexing of the portion A is taken care of by means of a plunger E, which engages with various bushings D in the base B. The handle F makes the operation rapid, and it is so arranged that it will pull up the plunger and hold it out of engagement while the turret is being indexed.

The toolblocks G, H, K and L each contain a tool which is set to produce a given diameter on the work as shown. These toolblocks are tongued so that they fit the T-slot R, in which they can be adjusted longitudinally. The tools mentioned are used for the finishing operation on the work. The roughing is done by those shown at M, N, O and P. These blocks are arranged so that they fit a T-slot Q, exactly the same as that on the other side of the turret. The advantages of this style of turret toolblock are evident, but when designing anything of this sort it must be remembered that a great deal of work is being done by the tools. As a consequence, the greatest care must be taken to make sure that sufficient strength is given to the various parts, to withstand the heavy cutting action.

Chart for Determining the Pressure Exerted by Boring Tools

Construction and Operation of Chart—Determination of End Thrust and Pressure Due to Cutting—Table for Values of the Feed to 0.7 Power

BY J. B. CONWAY

ON PAGE 655, Vol. 54 of the AMERICAN MACHINIST, appeared an article by the author entitled, "Chart for the Determination of Pressure on a Cutting Tool." This article referred to tools such as those used for lathe and planer work, and the chart was based upon formulas deduced by Mr. Taylor as the result of exhaustive experiments.

The chart accompanying this article is for the purpose of determining the end thrust and cutting pressure exerted by one- and two-lipped boring tools. It is based upon formulas evolved by Dempster Smith as the result of experiments, these formulas being given together with a brief treatise on the subject in Mark's "Mechanical Engineers' Handbook," page 1431.

A brief explanation of the chart follows. There are ten scales.

Scale (1) contains values for the constants used in the formulas, these varying from 27,500 to 57,000. They are indicated, however, by the letters (F) and (P) with descriptive notes.

Scale (2) shows the feed per revolution which is used. It is graduated from 0.005 to $\frac{1}{4}$ in., advancing by 64ths above 0.012 in.

Scale (3) is the support for the product of Scales (1) and (2); but as this result is not required to be known, the scale has not been graduated.

Scale (4) has the values for the width of the cutting lip. The graduations are in inches and tenths, the latter being used on account of their convenience and because the graduations give greater ease of interpolation.

Scale (5) is graduated in values representing pressures in pounds, and is the result of multiplying Scales (3) and (4) together. It gives the result sought from the quantities just mentioned.

Scale (6) contains points representing values of 300,000 and 400,000 together with explanatory notes. These points are to be used as those on Scale (1), but as they are multiplied by different values a separate scale was required. Scales (7), (8), (9) and (10) are similar to Scales (2), (3), (4) and (5), respectively.

The basic formulas, taken from Mark's handbook, are given herewith:

F = Cutting pressure in pounds.
P = End thrust in pounds.
w = Width of each cutting lip in inches.
t = Feed in inches per revolution of either the work or cutter.

For Boring:

Soft Steel: $F = 400{,}000\ wt$
$P = 38{,}000\ wt^{0.7}$
Medium cast iron: $F = 57{,}000\ wt^{0.7}$
$P = 27{,}500\ wt^{0.7}$

For Facing with a Two-Lipped Cutter from the Solid:

Medium cast iron: $F = 300{,}000\ wt.$
$P = 32{,}500\ wt^{0.7}$

For Facing Medium Cast Iron, After Trepanning or Opening the Hole:

$F = 55{,}000\ wt^{0.7}$
$P = 31{,}000\ wt^{0.7}$

The author of the data in the handbook is not definite as to just what is intended by "the width of each cutting lip," but it is presumed that it is to mean twice the width of the single lip. For example, if the width of one lip was $1\frac{1}{2}$ in. on a facing cutter, the value for w

would be 3 in. This scale on the chart is so arranged that either value may be used, but the result obtained of course, would be affected.

To read the chart, several examples will be given. Let it be required to find the end thrust, when facing medium cast iron from solid stock, with a feed of 0.006 in. and width of cutting lip of 3 in. From the proper point on Scale (1) connect with the feed, 0.006 in. on Scale (2). Pivoting on the point of intersection of this line with Scale (3), swing to the width of lip on Scale (4), and on Scale (5) read the value of the pressure, which in this case is approximately 2,200 lb., which for practical purposes is sufficiently close.

In another case the cutting pressure is required, when boring soft steel, using a feed of 0.150 in. and a tool with a 5-in. lip. Connect point on Scale (6) with the feed, 0.150 in. on Scale (7); then pivoting at the intersection of this line with scale (8), swing to the width of lip on Scale (9), and on Scale (10) read the cutting pressure in pounds. It is hardly probable that one would ever find this condition in actual work, and the example is cited merely to show the operation of the chart and the enormous pressure created under such a condition.

The other two examples shown on the chart are self explanatory. It will be noted that the feed on Scale (2) is graduated in thousandths and 64ths, while that on Scale (7) is given in thousandths and hundredths of an

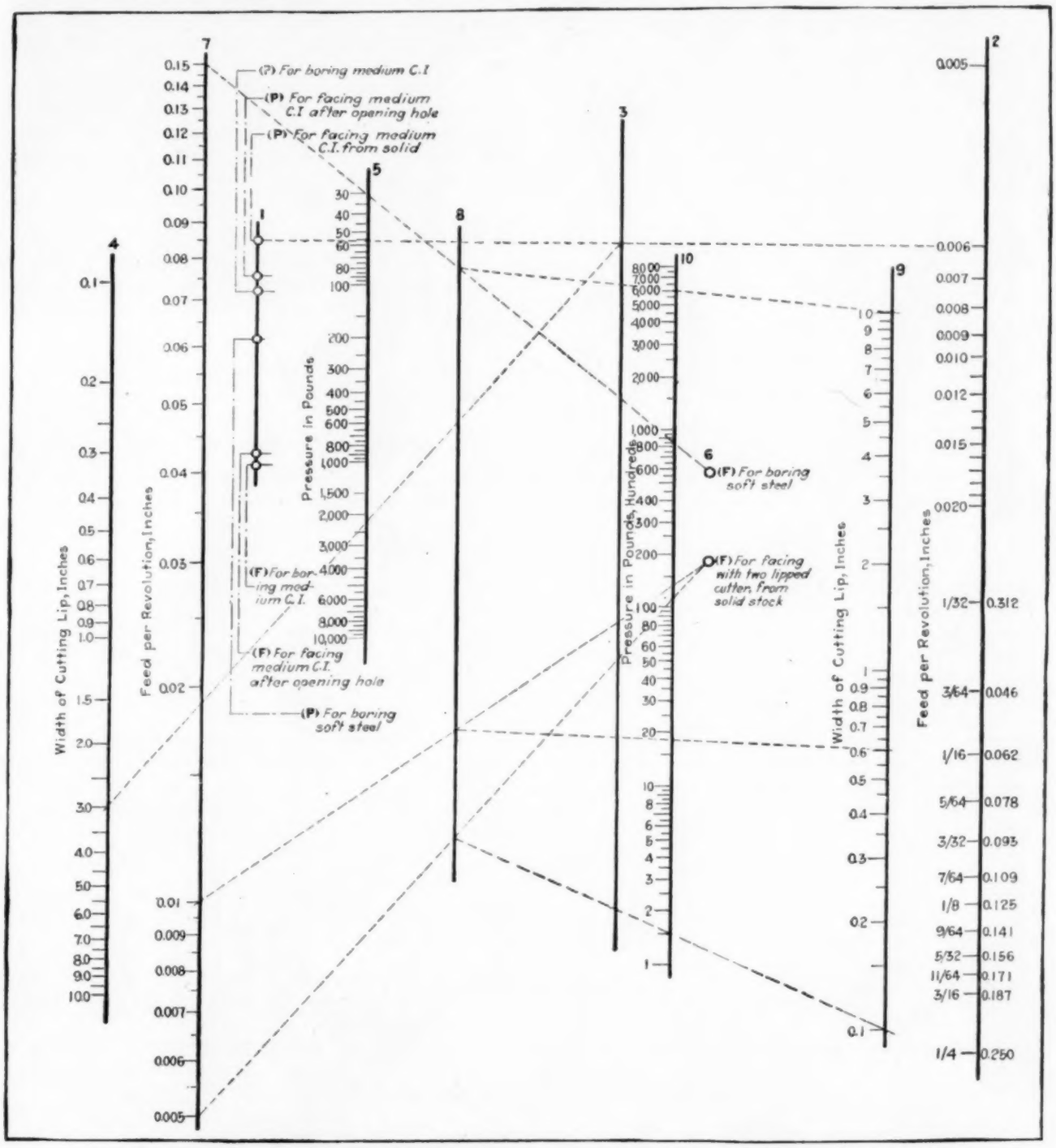

(P) For boring medium C.I
(P) For facing medium C.I after opening hole
(P) For facing medium C.I. from solid
(F) For boring medium C.I.
(F) For facing medium C.I. after opening hole
(P) For boring soft steel
(F) For boring soft steel
(F) For facing with two lipped cutter, from solid stock
Width of Cutting Lip, Inches
Feed per Revolution, Inches
Pressure in Pounds
Pressure in Pounds, Hundreds
Width of Cutting Lip, Inches
Feed per Revolution, Inches

CHART FOR DETERMINING THE PRESSURE EXERTED BY ONE- AND TWO-LIPPED BORING TOOLS

inch. This was done to afford ready recognition of the two scales, as they are not to be used as the same. The values on Scale (2) increase when reading downward, while they increase when reading upward on Scale (7). Also, the values for the pressure increase downward on Scale (5) and upward on Scale (10). This affords a means of distinction between the several scales which are related to each other. Scales (1), (2), (3), (4) and (5) operate together, while Scales (6), (7), (8), (9) and (10) belong to another group.

Feed to 0.7 Power

For the convenience of the reader, the values of the feed raised to the 0.7 power are given in the accompanying table. It is well to call attention here to the fact

TABLE OF NUMBERS REPRESENTING FEED IN INCHES RAISED TO THE 0.7 POWER

n = Number	Log n	Log $n^{0.7}$	$n^{0.7}$
0.005	7.69897	8.18927	0.01546
0.006	7.77815	8.44470	0.02784
0.007	7.84510	8.49157	0.03102
0.008	7.90309	8.53216	0.03406
0.009	7.85424	8.56796	0.03698
0.010	8.00000	8.60000	0.03992
0.011	8.04139	8.62897	0.04255
0.012	8.07918	8.65542	0.04523
0.013	8.11394	8.67975	0.04784
0.014	8.14613	8.70229	0.05039
0.015	8.17609	8.72326	0.05288
0.016	8.20412	8.74288	0.05532
0.017	8.23045	8.76132	0.05772
0.018	8.25527	8.77868	0.06007
0.019	8.27875	8.79512	0.06239
0.020	8.30103	8.81072	0.06467
0.0312	8.49485	8.94639	0.08839
0.0468	8.67094	9.06965	0.11740
0.0625	8.79588	9.15711	0.14360
0.0781	8.89279	9.22495	0.16770
0.0937	8.97197	9.28837	0.19070
0.1093	9.03892	9.32724	0.21240
0.1250	9.09691	9.36783	0.23330
0.1406	9.14807	9.40364	0.25330
0.1562	9.19382	9.43567	0.27270
0.1718	9.23522	9.46465	0.29150
0.1875	9.27300	9.49110	0.31090
0.2500	9.39794	9.57815	0.37860
0.3125	9.49485	9.64639	0.44300
0.3750	9.57403	9.70182	0.50330
0.4375	9.64098	9.74868	0.56060
0.5000	9.69897	9.78927	0.61560
0.5625	9.75012	9.82508	0.66847
0.6250	9.79588	9.85711	0.71970
0.6875	9.83727	9.88608	0.76927
0.7500	9.87506	9.91254	0.81760

that the values on Scale (2) represent the feed raised to the 0.7 power, while those on Scale (7) are the actual values, which is another reason for making a distinction between these scales. In connection with the article previously referred to, the values of feeds advancing by 64ths and raised to the 0.75 and 0.933 power can be found in Mark's handbook. The latter power has been changed from its fractional form, namely, 14/15ths, for convenience in handling the calculations.

The logarithms of the numbers, together with the values to the 0.7 power are correct only to three places, no attempt being made to procure accuracy beyond that figure, inasmuch as accuracy to even two places would no doubt be all that is required for practical purposes. For example, consider the value of $0.010^{0.7}$; which is 0.0399. It would make little difference in the ultimate result if 0.04 were used, for a factor of safety should be allowed in the construction of any parts which are designed to withstand the pressures determined by the chart, or formulas.

As an illustration of the practical use of the chart, it would be a simple task to determine the pressures exerted by the standard two-lipped boring and facing tools that make up any shop equipment, and tabulate these values on the data sheets for the cutters. Counter-bores and spot-facers would also be included. Then, with this information before the designer, his work of designing parts of machinery, tools, jigs and fixtures would be simplified. Whether or not a given job requiring boring or facing could be performed on a certain machine could also be predetermined with a fair degree of accuracy provided that the capacity of the unit was known.

On the other hand, the combined end thrust and cutting pressures have a tendency to distort cutter bars; so knowing in advance the approximate stress to which a bar will be subjected, it can be made sufficiently large to withstand the pressure or stress. This of course, would be governed somewhat by the construction of the part and the tooling conditions.

It is believed that this chart will be found useful in the designing of machine tools and fixtures. It can be used as a companion chart to the one previously published by the author and mentioned at the beginning of the article. These two charts with the one on drill pressures given in Halsey's "Handbook for Machine Designers" make a fairly complete set of data for reference purposes.

Big Shops Versus Little Shops

By Gus Haessler

In reading the late W. D. Forbes' letter, on page 99 of American Machinist, I was especially interested in his suggested method of procedure for getting out the work referred to. If a universal milling machine had been employed to do the drilling, it seems to me that all of two hours would have been consumed. However, that part of the work can be done in less time and with more economy if a bench lathe be used. The equipment should include a milling attachment, index, indexing mechanism and a ½-inch step chuck. The time required for setting up and drilling in a bench lathe is at least one half of that necessary for these operations in a universal milling machine. As the ten ⅛-in. holes are located on a ½-in. pitch circle, the drill will clear the chuck body in drilling through; or if desired, the work may be spotted, while it is in the lathe, and the drilling done afterwards on a sensitive drilling machine.

Influence of the Automotive Industry on Thread-Cutting Tools

Development of Interchangeability in the Automobile Industry—Changes in Methods of Manufacturing Threading Tools—Design of Landis Die Head

By C. N. KIRKPATRICK and G. G. VINK,
Sales Manager and Engineer, Landis Machine Co.

THE development of the automotive industry with the concurrent demands in all its various departments for greater production, interchangeability and accuracy, has necessitated radical changes in method, and in the design of many tools and machines. Not the least important are the changes in the requirements of the screw thread, which requirements, in turn, caused a departure in the specifications, as well as in the equipment and method of thread cutting.

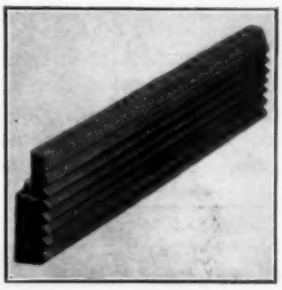


FIG. 1. LANDIS CHASER

The aim of this article is not to discuss in detail the limits of the specifications and standards of screw threads, but to treat of the changes required in the manufacturing of a particular type of thread-cutting tool in order to meet the present standards.

There are many makes of thread-cutting die heads and machines on the market, but only two distinct types of thread-cutting tools; namely, the hobbed chaser and the flat bar chaser milled and hardened for its entire length, as manufactured by the Landis Machine Co. of Waynesboro, Pa. The latter type has been employed very extensively by the manufacturers of motors, automobiles, tractors and accessories, and this article will deal with its development only.

Figs. 1 and 2 show the outstanding features of this type of die. It will be noted that the life is three-quarters of the length of the tool; that the rake angle may be varied from 5 deg. negative to 50 deg. positive without interfering with the efficient operation of the tool; that the same set of chasers can be used for right or left-hand threading by merely grinding both cutting ends and using right- and left-hand chaser holders; and that the die is tangentially disposed to the work, which makes for low friction and a correspondingly high cutting speed. The fact that the chaser is hardened its entire length, makes its sharpness renewable by a slight grinding at the cutting edge, and the necessity of annealing, hobbing and retempering is eliminated.

Increase of Production

Mass production on an intensive scale was introduced in plants manufacturing automotive equipment in about 1910. At that time the requirements for screw threads were not so strictly held. It is recalled that inspection of screw threads at that time consisted in measuring the pitch diameter with a micrometer, and the pitch by means of a scale. The limits for pitch diameter at that time were from 0.003 to 0.004 in., and the pitch could vary about 0.004 in. The taper of the thread was not given much consideration, particularly on threads not longer than 1 in. In other words, the standard for screw threads employed in automotive equipment was very little higher than that maintained in manufacturing commercial bolts.

The inspection of the chaser at that time was correspondingly crude. The milling cutter which formed the threads on the chaser, was inspected by making a test cut on a flat piece of steel. This test cut was examined by means of a magnifying glass to determine if the flats on the tops and bottoms of the threads were alike. The pitch of the thread was measured by the wire method. Two wires 1 in. apart were placed in the grooves of two threads, and the pitch measured by means of a micrometer. A tolerance of minus 0.001 to plus 0.003 in. was permitted. After the hob passed this simple test, the chaser was made, and was inspected for uniform thickness and finish. It was then hardened, and given a final inspection for straightness.

About 1914 it was noted that closer limits were being held on screw threads. This closer inspection was augmented a little later by the development of the aeroplane motor. It was plainly to be seen that the

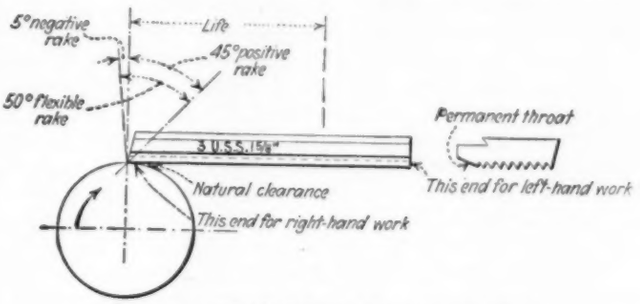


FIG. 2. ACTION OF FLAT BAR CHASER

screw thread employed in the aeroplane played a more important part, due to the great strains and vibrations unknown to land vehicles. As motors of greater power and speed were developed for automobiles and trucks, the inspection of screw threads became stricter, and efforts were made to maintain very close limits, particularly on the pitch, pitch diameter and outside diameter.

This inspection of the thread entailed the use of the latest type of microscopic measuring machines, which brought to light many errors, not only in the form of the thread, but also in the angle, the depth and the width of the flats. The pitch and taper of the thread were usually inspected by means of gages, whereas the pitch diameter was ascertained by micrometer reading, the same as in former years. The tolerances, at the present time, for pitch and pitch diameter are usually 0.001 in. plus or minus, and no taper is permitted, as far as it is possible to cut an absolutely straight thread with a die.

The methods of manufacturing and inspecting the Landis chaser changed with the maintenance of closer

limits on screw threads. The present methods have been in effect for the past several years and will, of course, be improved as the requirements and standards change.

The tool which forms the milling cutter is measured

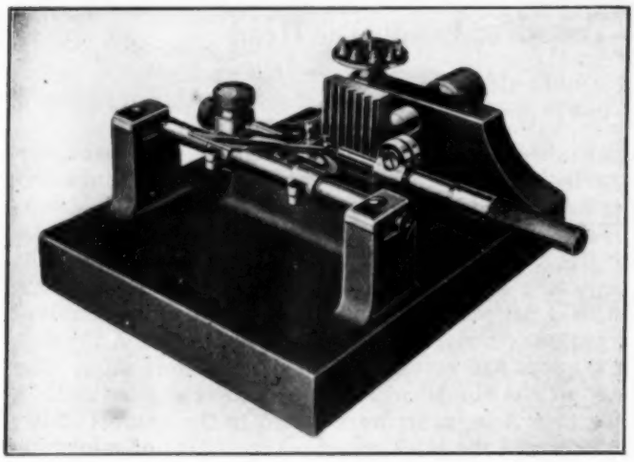


FIG. 3. PITCH AND LEAD MEASURING INSTRUMENT

on a microscopic measuring machine for the flats and angle. The milling cutter is then formed, and with it a test cut on a flat piece of stock is made. The test cut is measured for pitch by means of a precision, pitch and lead measuring instrument, shown in Fig. 3 and described later. In measuring the hob, the limit for depth is nothing minus and 0.002 in. plus. The limits for pitch are plus 0.001 to plus 0.0025 inch.

When the milling cutter passes satsfactory inspection, two sets of chasers are milled. These chasers are measured for pitch, depth, angle and flats by means of the measuring machine manufactured by Alfred Herbert, Ltd., Coventry, England. The chasers are then hardened and inspected for straightness. Test cuts are made with the chasers without the aid of a leadscrew, as this permits a reproduction of the chaser form without any other controlling factors. The cuts are also measured on the Herbert measuring machine for depth, angle, and the flats on the top and bottom of the thread. The pitch of the test cut is measured with the pitch and lead measuring instrument already mentioned.

The precision pitch and lead measuring instrument was designed so as to insure accurate measuring of the pitch and lead of the chasers. This instrument is employed for measuring not only the chasers, but also the test cuts made with them.

Pitch Measuring Instrument

The instrument consists of a main body or casting having a face, or work clamping surface. Parallel to this surface is clamped at the front a hardened and ground bar, which supports the carriage that moves longitudinally. The carriage is equipped with a plunger and an indicator. A ball-pointed end is screwed in the end of the plunger and dropped in the thread to be measured. A micrometer fastened to the main body of the instrument is brought in contact with the indicator, and moved until the indicator points to zero on the dial. The micrometer reading is then taken. The readings of adjacent threads are taken, and the difference between such readings gives the pitch measurement.

Ball-pointed ends of various diameters are inserted in a small disk conveniently located on top of the instrument. The micrometer employed is graduated to read to 0.0001 in., and has a range of 0 to 2 in. The bearing parts and measuring surfaces are hardened to reduce wear, and means are provided to compensate for any wear which may occur. This instrument has been found to be very successful where close limits in pitch and lead must be maintained.

While the chaser does the actual thread cutting and must, therefore, be made as accurately as possible, yet the chaser holder or the block in which the chaser is held plays an equally important part. The threads on the chaser are milled parallel to its finished seating surface, so that the chaser has nothing to do with obtaining the proper helix angle. The chaser holder controls the helix angle and is milled at an angle, so as to incline the chaser to correspond to the helix angle of the particular diameter and pitch.

For commercial threads, one set of chaser holders will cover a very wide range, for instance, from $\frac{1}{2}$ to $1\frac{1}{2}$ in. inclusive. This is possible because the diameters increase while the pitches decrease, maintaining a close ratio. The chaser holders are, therefore, milled for a mean helix angle between the minimum and maximum diameter. To illustrate, the helix angle for $\frac{1}{2}$-in. diameter, 13-pitch is 3 deg. 7 min., and the helix angle of $1\frac{1}{2}$-in. diameter, 6-pitch is 2 deg. 11 min. The seats of the chaser holders are milled for a mean angle of $2\frac{3}{4}$ deg. In this manner the angle of the chaser holder is almost exact for $\frac{3}{4}$-in. diameter, 10-pitch, and sufficiently close on the other threads mentioned that the variations do not show up on commercial threads. The advantage in milling the chaser holders for the mean diameter is, of course, plainly seen, as it eliminates the necessity of a set of chaser holders for each diameter and pitch.

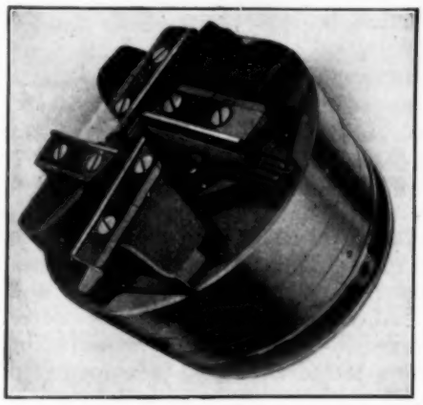


FIG. 4. LANDIS DIEHEAD

When cutting S. A. E. standard threads, which are employed quite extensively on automotive parts, the chaser holders are confined to a much smaller range. This, of course, is due to the greater degree of accuracy required. A set of chaser holders for 1-in. diameter, 20-pitch, and $\frac{7}{8}$-in. diameter, 18-pitch, will be milled for an angle very close to the helix angle of those diameters and pitches, and no effort will be made to include a range of diameters. The helix angle of $\frac{1}{2}$-in. diameter, 20-pitch is 1 deg. 57 min., and the helix angle for $\frac{7}{8}$-in. diameter, 18-pitch is 1 deg. 55 minutes. The set of chaser holders, therefore, for these diameters and pitches would be milled for a helix angle of 2 degrees.

In some special cases it has been found advisable to limit a set of chaser holders to one diameter and pitch. This occurs only when extreme accuracy is to be maintained. For instance, a set of chaser holders for $1\frac{1}{16}$-in. diameter, twelve threads per inch may be milled for an angle of $1\frac{1}{2}$ deg., which is the exact helix angle for that diameter and pitch.

It, no doubt, has been noted that often on automotive parts, a fine-pitch thread is employed on large diameters. Due to the fine pitch, it would be extravagance to purchase a large and powerful machine merely because of the large diameter to be threaded. Consider, for instance, a thread 2¼-in. in diameter and of 16-pitch. Basing the recommendations on a suitable machine for the diameter, a machine of the 2½-in. size would be specified, yet on account of the fine pitch, a 1-in. machine would be ample in capacity. The 1-in. machine, of course, should be recommended with the understanding that the length of the thread would not exceed 1½ in. Special built-up and off-set chaser holders must be furnished.

The holder is built up and the chaser seat is off-set, so that a diameter of 2¼ in., for instance, could be accommodated very nicely. The holder must be built up so that the full length of thread can be cut without necessity for the stock to enter the bore of the head.

Making a Holder

The method of making the chaser holder is of interest. The holder, the shape of which can be seen in the view of the die head shown in Fig. 4, is made from a steel casting. The first operation is to mill the bottom, or that part which rests against the face of the die head. The holder is then drilled, spot-faced, counterbored and shaped on the under side, so that it will fit the sliding block which is supported on the face of the head by a pin. The abutting screw hole is drilled and then the holder is rough milled to a pre-determined helix angle. For the milling operation a jig is employed, which has universal adjustment and which is graduated in minutes. The holder is then scraped for bearing and finish, after which it is finish milled. The clamping screw holes are drilled and tapped, and the chaser holder is then ready for assembling.

After the chaser holder is completed, it is given a careful inspection by means of a special device which supports the chaser holder in the same position as on the die head. A master chaser is then inserted in the seat; and by means of a micrometer measuring device, it

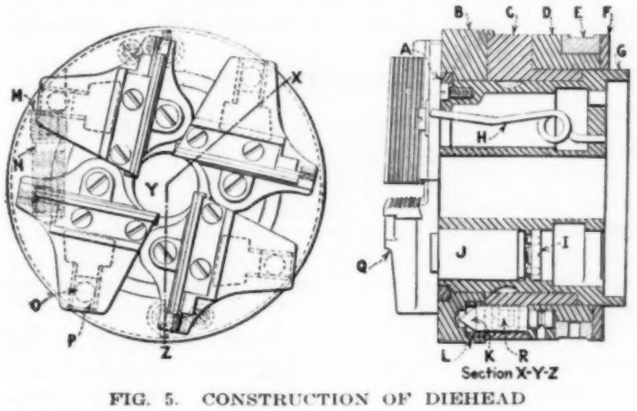


FIG. 5. CONSTRUCTION OF DIEHEAD

is determined if the holder is milled at the proper angle. If it passes that inspection, the chaser clamp which holds the chaser in the holder is fitted; and the completed holder is then tested out in actual cutting.

That the limits which are maintained in making the chaser holders are critical, may be surmised from the fact that when counter-boring the ear of the chaser holder, or that part of which fits over the trunnion, the limits are 0.8745 to 0.8755 in. for the 1-in. head and 1.2495 to 1.2505 in. for the 1½-in. head. The sliding block slot on the under-side of the chaser holders is held to limits of 0.7387 to 0.7403 in. for the 1-in. head and to 0.986 to 0.987 in. for the 1½-in. head.

The Die Head

The results obtained from the chaser and chaser holder are dependent, to a certain extent, upon the die head which supports them. Fig. 4 shows the all-steel rotary die head, and Fig. 5 its principle of operation.

The diametrical or size adjustment is obtained by means of the adjusting worm *N*, located in the adjusting ring *C*. This worm engages the body *G*, and moves as a unit the closing ring *B*, the adjusting ring *C*, the the operating ring *D*, the yoke stop ring *F*, and also the chaser holders *Q*. The body *G*, the closing-ring retaining ring *A*, and the yoke ring *E* determine the proper adjustment of the chaser holders *Q*, which adjustment is maintained by means of the worm locknut *M*.

The die head is locked by the engagement of the two closing pins *K* in the bushing *L*. This prevents any movement of the closing ring *B*, except that obtained by the worm *N*. The head is opened by means of the backward movement of the yoke ring *C*. When the conical surfaces of the pins *K* engage the bevel surfaces of the bushings *L*, the closing ring *B* is released and the force of the chaser-holder springs *H* rotates the ring *B* and the holders *Q*. The chaser holders *Q* are fastened to the trunnions *J* and are supported at their outer ends by the adjusting blocks *P*.

Care in the inspection of the parts of the die head during the course of machining and assembling has increased proportionately with that in the inspection of the chaser holders and chasers. It is unnecessary to state the limits of each and every part of the head, but it will suffice to say that limits vary from 0.0025 in. in grinding the trunnions to 0.003 in. in turning the head body.

After the head is assembled, test cuts are made in cutting minimum, mean and maximum diameters within its range. The test for heads for threading commercial work is the same as for the head which is to be employed on the most accurate work. Thus, it is possible for any head in service, with the proper equipment of chaser holders and chasers, to be used on particular threading jobs.

The cutting of threads on automotive parts requires a machine with a leadscrew attachment. With the non-leadscrew machine, the start of the thread depends almost entirely upon the manner in which the operator feeds the stock in the die head. As human power is variable, it is impossible to obtain the same steady start at all times, and consequently the first thread on the stock is apt to be imperfect. The leadscrew eliminates this trouble and maintains a high degree of accuracy, as it controls the leading feature and relieves the chasers entirely of this duty.

The precision maintained in manufacturing the chasers and parts of the machines insures interchangeability. Any one chaser, or in fact, any one part of a die head or machine may be applied to the die head or machine at any time after the equipment is placed in service. The importance of perfect interchangeability may be appreciated when it is considered that slight error in the head or machine may be multiplied many times at the cutting edge of the chaser. The accuracy of the threads produced really depends, therefore, upon a high standard of interchangeability.

Amortization of Plant Facilities

Regulations 62 of the Treasury Department Give Manufacturers Another Chance to File Claims—Substantial Relief Available Under Little-Understood Provision

By F. H. FIGSBY
Ernst & Ernst, New York

CONGRESS, in drafting the Revenue Act of 1918, recognized that following the entry of the United States in the World War a large number of manufacturers were compelled to pay abnormal prices for new buildings, machinery and equipment and that many of these facilities would become worthless or diminish greatly in value when the abnormal demand for production receded. It was logical that this abnormal cost should be charged against income during the abnormal period of production and Congress accordingly provided for a deduction by "Amortization" of the cost of these facilities.

The original regulations of the Internal Revenue Bureau provided that the date of April 1, 1919, should be tentatively used as the end of the amortization period, but subsequently provision was made for deductions from income in 1918, 1919 and 1920. The Revenue Act of 1921, recently enacted, provides for a similar deduction in 1921 but to obtain the benefit of this deduction it is required that claim therefore be filed not later than the time of filing the tax return for 1921, which, in the case of a taxpayer whose accounting year conforms with the calendar year, would ordinarily be March 15, 1922. *This limitation as to the filing of claims for the year 1921 does not, of course, preclude the filing at a later date of claims or amended returns for prior years.*

Here is the section under which amortization deductions are allowed:

Deductions Allowed

(Sec. 214. (a) That in computing net income there shall be allowed as deductions:)

(9) In the case of buildings, machinery, equipment, or other facilities, constructed, erected, installed, or acquired, on or after April 6, 1917, for the production of articles contributing to the prosecution of the war against the German government, and in the case of vessels constructed or acquired on or after such date for the transportation of aticles or men contributing to the prosecution of such war, there shall be allowed, for any taxable year ending before March 3, 1924 (if claim therefor was made at the time of filing return for the taxable year 1918, 1919, 1920, or 1921) a reasonable deduction for the amortization of such part of the cost of such facilities or vessels as has been borne by the taxpayer, but not again including any amount otherwise allowed under this title or previous Act of Congress as a deduction in computing net income. At any time before March 3, 1924, the Commissioner may, and at the request of the taxpayer shall, re-examine the return, and if he then finds as a result of an appraisal or from other evidence that the deduction originally allowed was incorrect, the income, war-profits, and excess-profits taxes for the year or years affected shall be redetermined; and the amount of tax due upon such redetermination, if any, shall be paid upon notice and demand by the collector, or the amount of tax overpaid if any, shall be credited or refunded to the taxpayer in accordance with the provisions of section 252; * * *

The wording of the law in confining the deduction of amortization to "buildings, machinery, equipment or other facilities constructed, erected, installed or acquired for the production of materials contributing to the prosecution of the present war," has been misconstrued by many taxpayers to apply only to corporations who were manufacturers of munitions under government contracts or who purchased machinery or equipment of special design such as would not be readily adaptable to commercial business. On the contrary, this privilege of reducing income during the high tax years applies, with but few exceptions, to every corporation which between the dates of April 6, 1917, and November 11, 1918, increased its plant facilities to maintain or increase the production of any article which directly or indirectly contributed to the prosecution of the war. It applies to a coal mine or a flour mill as readily as to a munition factory.

Value of a Special Machine

It is not necessary that the facilities be of a special design; undoubtedly, a special machine would be of less value under post-war conditions, but this is only a matter of the degree in which amortization may be claimed.

In the regulations of the Internal Revenue Bureau, deductions for amortization fall within two general classes:

Class 1 includes all property which has been sold or discarded or will be discarded prior to March 3, 1924.

Class 2 includes all property which the taxpayer retains in use.

The amortization allowance in the case of Class 1 property is usually equal to the cost of the property or the difference between such cost and its scrap or salvage value.

The allowance in the case of Class 2 property is the difference between cost and its value under post-war conditions.

The Value-in-Use Problem

The problem of determining the "value-in-use" under post-war conditions is not without its difficulties. The regulations of the Internal Revenue Bureau do not permit of the application of an arbitrary percentage to cost nor do they recognize pre-war costs as indicating probable post-war values. They do, however, recognize the replacement values as of today, compared with the inflated prices of 1918.

It is necessary to determine from an analysis of the operating history of each taxpayer what value the facilities have in his business under stable post-war conditions—whether his operations will permit him to use these facilities to a certain extent of their capacity and to know whether such value-in-use is more or less than the post-war market price for used facilities of the same general character.

There is nothing mysterious about the computation of amortization. Like most important subjects, special training is essential to obtain the best results. It is an accounting problem involving certain engineering principles—in fact, the Internal Revenue Bureau employs engineers especially for the verification of amortization claims. These engineers, however, are only assigned to

the examination of claims that have been prepared in conformity with the requirements of the bureau.

In order that the principles of this important subject may be understood, let us assume a simple case, excluding all complexities:

A Case in Point

The A. B. C. Manufacturing Co. was organized in 1914 and the following is a summary of its investment in plant facilities, exclusive of land, and its production from 1914 to 1921, inclusive:

Year	Cumulative Plant Investment	Production in Units
1914	$120,000	600,000
1915	160,000	700,000
1916	175,000	800,000
1917	250,000	1,100,000
1918	650,000	1,700,000
1919	650,000	1,200,000
1920	650,000	900,000
1921	650,000	800,000

It is quite apparent that this corporation has little, if any, present benefit from the expenditures made in enlarging its plant. With an investment of $120,000 in 1914, 600,000 units were produced. Nothwithstanding an increase in investment of approximately 540 per cent, the production of 1921 is but 33⅓ per cent in excess of that of 1914. It is, of course, a matter of opinion whether the production of 1921 may be considered normal, but it would appear from the pre-war demand for this product that a further decline in production will ensue.

An analysis of the additions made since April 6, 1917, indicates that while a considerable portion of the new facilities are being used, the same production could be obtained from the facilities which had been installed prior to April 6, 1917.

A Deduction Justified

After a careful analysis of the operating history of the corporation to determine the residual value of its war facilities, it is found that the following conservative amortization deduction is justified:

Class 1	Amortizable Cost	Residual Value	Amortization
Machinery	$80,000	$27,000	$53,000
Class 2			
Buildings and Machinery	320,000	154,000	166,000
Total	$400,000	$181,000	$219,000

Assuming that 75 per cent of this amortization is applicable to the year 1918 and 25 per cent to the year 1919, the saving in Income and Profits Taxes would be as follows:

1918	$135,342
1919	24,385
Total	$159,727

Many taxpayers claimed the benefit of an allowance for amortization in preparing their Income and Profits Tax Returns for 1918 and 1919, the computation of the allowance being based upon estimated replacement value under post-war conditions or upon the estimated abnormal cost of the facilities as compared with pre-war costs. Such claims are not acceptable to the Internal Revenue Bureau and unless the taxpayer revise his claim in conformity with present regulations he will in due time be notified that his deductions have been disallowed and additional tax will be assessed accordingly.

On the other hand, many claims which were prepared in the approved manner up to Jan. 1, 1921, do not now reflect the fair allowance to which the taxpayer is entitled. This is due to the changed prices and conditions which in many cases have materially increased the amount of amortization which could properly be claimed. Notwithstanding that amortization engineers of the Internal Revenue Bureau may have inspected the taxpayer's property and made an amortization allowance, the law provides that at any time prior to March 3, 1924, the Commissioner of Internal Revenue may, and upon request of the taxpayer shall, reopen the claim and redetermine the amortization allowance.

String Board Graphics

Percy S. Brown
Works Manager, Corona Typewriter Co., Inc.

The use of string board graphics must not be confused with those of a permanent nature, though used in the same manner and for obtaining the same kind of information. Through their very nature they are for periodical control rather than for permanent data, inasmuch as the strings are moved back and forth either daily, weekly or for such other periods as one may desire to cover. All information of an historical nature is lost, except where it may be desirable to photograph the boards previous to each posting; in such instances records of a permanent nature might be secured, limited only by the inability to reproduce colors in cases where strings of various colors are used on the same board.

The string boards may be of whatever size and shape the designer desires, depending on the number of parts, operations or other data he may wish to show. No matter what the size or shape, the same plan is followed: First, notches or grooves are cut along the top of the board, spaced as desired, and parallel notches or grooves are cut along the bottom of the board. It may be desirable in some instances to substitute grooved rollers for the notches, particularly in the cases of very high boards where freedom of string motion may be impaired unless assisted mechanically. Along the left sides of the board, graduations are drawn, either on the board itself or on the heavy paper affixed to the board, and correspondingly along the right side of the board similar graduations may be drawn. These graduations may be continued across the entire board or only part of them may be continued, as they are merely to facilitate posting. At the lower edge of the board a heavy paper runner is placed, on which is printed the information as to the parts, operations, or names of whatever other items are to be controlled. A piece of colored string and piece of white string of equal length are then tied together around the board, being drawn as tight as possible. When posting, the colored string, which is always at the bottom, is moved up to the proper point by taking hold of the knot and the knot then becomes the controlling point.

We are preparing to extend the use of the boards for securing information in connection with employment, sales, etc. The boards are quite inexpensive and can be made by any carpenter while the charts or strips can be easily made by anyone.

Outline of address before the Taylor Society, Philadelphia, March 18, 1922.

Novel Applications of the Hartness Screw Threading Attachment

By H. A. Loudon

The Hartness screw threading attachment was devised to render the Jones & Lamson turret lathe available for cutting threads of any desired pitch. The

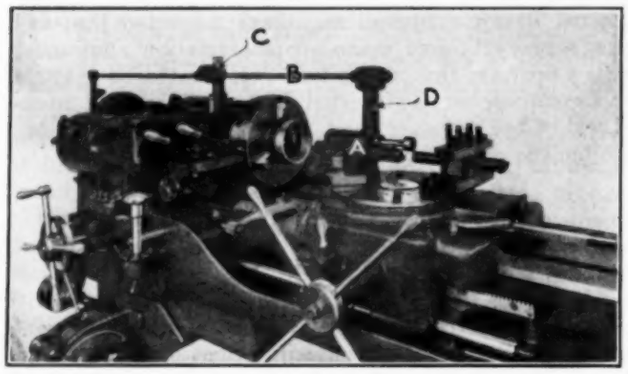


FIG. 1. THE DEVICE IN PLACE ON THE J & L

accompanying illustrations show two applications of the tool that were not contemplated in its design, but which it accomplishes well without change except in the manner of attaching it.

The device is shown in Fig. 1 in place on the turret of a J. & L. machine, with a bronze bushing, one shoulder of which is to be tapered, in the chuck. The piece is bored and faced in the ordinary way by the use of the proper turret tools, and there the use of the J. & L. machine would ordinarily end; necessitating a separate handling of the piece in order to turn the taper.

What the Attachment Is

For the benefit of readers to whom the threading attachment is not known, a cut of the mechanism is shown in Fig. 2 with a brief description of its movements. The base of the housing *A*, Fig. 1, attaches to the turntable of the machine by suitable bolts and clamps, and can be set in any desired position relative to the work. It derives its movement from the headstock through the horizontal shaft *B* and vertical shafts contained in the sleeves *C* and *D*, both of which are arranged to swivel.

Rotary movement is transmitted through helical gearing and the swiveling feature, in conjunction with the sliding movement of the shaft *B* which is splined to the

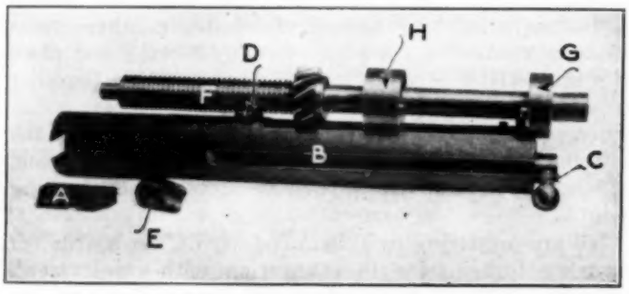


FIG. 2. WORKING PARTS OF THE ATTACHMENT

gear at the headstock end, allows the movement of turret or cross-slide without interfering with the action of the device.

The tool *A*, Fig. 2, slides in the dovetail slot across the end of the bar *B*, and is actuated to and from the cut by an eccentric pin in the end of a shaft passing longitudinally through the bar and terminating at the other end in the handle *C*. On this shaft is a cam which moves the half nut *D* (shown separately at *E*) into or out of engagement with the master screw F.

A pin in the collar *G* throws the nut into engagement with the screw by imparting a partial rotation to the central shaft and the tool is thus moved forward in proper relation to the rotative movement of the work spindle, until the pin in collar *H* moves this shaft back again, withdrawing the cutting tool and the nut at the same time.

A friction-driven pinion on the lower end of the vertical shaft which drives the master screw is always in mesh with a rack on the back of the bar *B*, and, as soon as the nut *D* is withdrawn, returns the bar to the starting point, where it is again reversed by the pin in collar *G*.

Taper Turning

To turn the taper on the piece under consideration the device was located on the turntable at the desired angle, and a turning tool substituted for the threading tool. Bringing the cutting point in proper relation to the work by the combined movement of turret slide and cross movement of the head, the turret slide is clamped in place and the device thrown into action, when the cutting tool passes rapidly back and forth over the

FIG. 3. CUTTING SCROLLS BY MEANS OF THE DEVICE

work, while the feed is applied by turning the handwheel which operates the cross movement.

If the casting to be turned is rough or at all out of round it is advisable to break the scale with one of the turret tools, which can easily be done by manipulating the traverse and cross movements in conjunction by hand.

Another application is shown in Fig. 3, where the tool is in use for cutting scrolls, which may thus be bored and faced on the J. & L. machine in one set up. For this work the attachment is placed with the bar at right-angles to the center line of the work spindle and the cutting tool turned around to face the work. The feed in this case is provided by the longitudinal movement of the turret slide; the withdrawal of the tool at each traverse being automatically taken care of by the device itself.

Forged or Rolled Steel for Gears

The Committee on Metallurgical Standardization of the A. G. M. A. submits the following explanation for Chart No. 1 on "Specifications for Forged or Rolled Gear Steels," which was adopted as recommended practice of the American Gear Manufacturers Association. Suggestions and constructive criticism will be appreciated.

CHART NO. 1. SPECIFICATIONS FOR FORGED OR ROLLED GEAR STEELS

A.G.M.A. Spec.	S.A.E. Spec.	Carbon	Silicon	Manganese	Sulphur	Phos.	Nickel	Chrome	Van	Process
	1,020	.15-.25	.10-.25	.30-.60	Max. .05	Max. .045	.....	.....	.....	Open hearth
1,030	.....	.25-.35	.10-.25	.50-.80	Max. .05	Max. .05	.....	.....	.....	O.H.
1,045	.....	.40-.50	.10-.25	.30-.50	Max. .05	Max. .05	.....	.....	.....	O.H.
.....	2,315	.10-.20	.10-.25	.50-.80	Max. .045	Max. .04	3.25-3.75	.....	.....	O.H.
.....	2,345	.40-.50	.10-.25	.50-.80	Max. .045	Max. .04	3.25-3.75	.....	.....	O.H.
2,350	.....	.45-.55	.10-.25	.40-.70	Max. .045	Max. .04	3.25-3.75	.....	.....	O.H.
.....	3,115	.10-.20	.10-.25	.50-.80	Max. .045	Max. .04	1.00-1.50	.45-.75	.....	O.H.
.....	3,215	.10-.20	.10-.25	.30-.60	Max. .04	Max. .04	1.50-2.00	.90-1.25	.....	O.H.
.....	3,245	.40-.50	.10-.25	.30-.60	Max. .04	Max. .04	1.50-2.00	.90-1.25	.....	O.H.
	3,315	.10-.20	.10-.25	.30-.60	Max. .04	Max. .04	3.25-3.75	1.25-1.75	.....	Electric
	3,340	.35-.45	.10-.25	.30-.60	Max. .04	Max. .04	3.25-3.75	1.25-1.75	.....	Electric
	6,120	.15-.25	.10-.25	.50-.80	Max. .04	Max. .04	.....	.80-1.10	.12-.25	O.H.
	6,145	.40-.50	.10-.25	.50-.80	Max. .04	Max. .04	.....	.80-1.10	.12-.25	O.H.
	6,150	.45-.55	.10-.25	.50-.80	Max. .04	Max. .04	.....	.80-1.10	.12-.25	O.H.

Note:—This chart conforms to the S.A.E. specifications with the addition of 1,030, 1,045 and 2,350, and the above additions are now being considered by the S.A.E.

It is understood that where the open hearth process is specified, the electric is an acceptable alternative, but *the reverse of this will not be true.*

No. 1020 is a low carbon machinery steel of good quality, and low enough to case harden well. This is a standard S. A. E. specification.

No. 1030 is medium carbon machinery steel, too high to case, and intended primarily for use in its untreated state, so far as gear work is concerned. For pinions it is suitable to mate with cast-iron gears. This differs only in the phos. from S. A. E. 1030, which has 0.045 per cent phos.

No. 1045 is a machinery steel of high enough carbon to be satisfactorily hardened, yet not so high in carbon and manganese as to cause risk when water-quenching. This differs in manganese specification from the corresponding S. A. E. steel which has 0.30 to 0.60 per cent manganese.

No. 2315 is a low carbon 3½ per cent nickel steel for case hardening.

No. 2345 is a 3½ per cent nickel steel of high enough carbon to be hardened directly. This is a standard S. A. E. specification.

No. 2350 is a similar steel with higher carbon and lower manganese giving better hardening qualities on gears of heavy section. This differs in manganese from the corresponding S. A. E. specification, which has 0.40 to 0.70 manganese.

No. 3115 is a low carbon chrome nickel steel suitable for case hardening. It is cheaper and easier to machine than those which follow.

No. 3215 is a medium chrome nickel steel suitable for case hardening. This is a standard S. A. E. specification.

No. 3245 is a similar steel but with high enough carbon to harden directly. While there is no S. A. E. No. 3245, this conforms to S. A. E. type of specification.

No. 3315 is a high chrome nickel steel suitable for case hardening. This is a variation of S. A. E. No. 3315 and it may be desirable to drop it in favor of the latter.

No. 3340 is a high chrome nickel similar but with carbon enough to harden directly. This is a standard S. A. E. specification.

No. 6120 is a low carbon chrome vanadium suitable for case hardening. This and the two following steels are variations of the S. A. E. steels of similar numbers, which call for a minimum vanadium of 15 per cent. It may be desirable to adopt the latter.

No. 6145 is a similar steel with carbon enough to harden directly.

No. 6150 is a similar steel with 0.05 more carbon which enables it to be hardened to give somewhat higher physical properties, especially needed on gears of heavy section.

It is believed that this chart contains steels which cover the full range of requirements of gear work, and with suitable modifications of heat-treatment it should not be necessary to go outside this list to get any physical properties that may be reasonably required in a gear.

Romances of Metal Working—The Metal Worker and the Painter

BY H. H. MANCHESTER

Tales of metal working are not as common in the East as might be expected, until Arabian conquests lent importance to the sword and the Crusades developed armor.

One mediaeval Buddhist story is that of a metal worker and a painter, in which the metal worker gets decidedly the worst of the joke. The smith had constructed a beautiful automatic maiden, which, when the painter stopped at his house, he sent in to wash the painter's feet. The painter was so taken with the maiden that he grasped her in his arms and broke the mechanism to pieces.

"Well," exclaimed the painter to himself, "the smith has made a fool of me in private, but I will make one of him in public."

Thereupon he painted a picture of himself upon the door as if he had committed suicide by hanging. The smith, when he saw it, was frightened, thinking the painter had committed suicide through chagrin. As there was a law that such cases should be reported to the authorities before the body was touched, the smith hurried to the governor of the city, who came with his officers to look into the matter. When they started to take down the body, however, they discovered it was only a painting, whereupon the painter stepped forth and told why he had played the trick. Thus the laugh was on the smith.

The idea back of the story seems to be a comparison of the two arts of metal working and painting, in respect to which creates the most life-like representation of the subject.

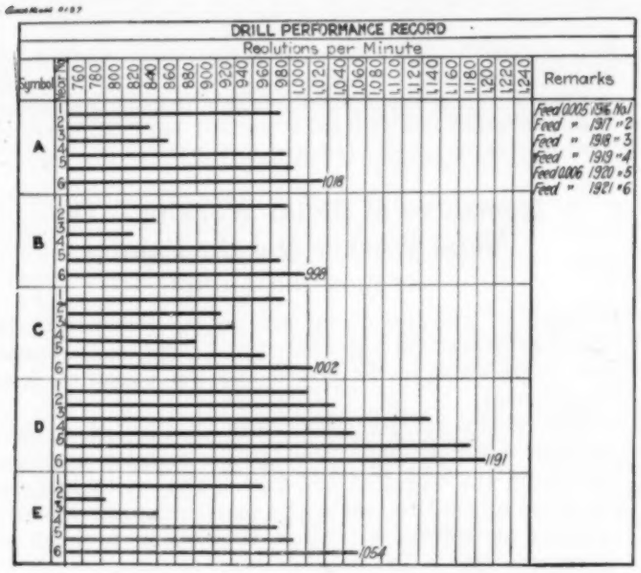
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Perpetual Drill Performance Record

BY H. M. FITZ

The record here described has been in use since February, 1916, and has been the means of saving thousands of dollars. A speed and feed chart for different



SAMPLE RECORD OF 19/64-IN. DRILLS

size drills and varying materials was made from this record and copies placed in frames convenient to the various drilling machines. Contract prices are figured according to these speed and feed standards.

By numbering the years (1916—No. 1, 1917—No. 2, etc.) graphic records for any number of drill sizes can be kept by the year—one card for each drill size, as illustrated. It is a visual record and tells any one instantly the most efficient drill by symbol, *A*, *B*, *C*, *D* or *E*, each representing a different make of drill. The price per drill varies somewhat but amounts to little as more holes per usable inch of drill take care of a slightly increased cost. The card is good for at least twelve years by using the reverse side.

A sample drill may do exceptionally good work. It is not a case of one or two drills doing the business, but when you have a record of drill performances it means that they must all make good or that brand is not purchased for production. This drill record shows actual performance under production conditions—on the same drilling machine, same material and with drills always machine ground and fed automatically, never by hand. The speeds and feeds are changed in accordance with the performance. In 1918 a 19/64-in. drill failed at 1,130 r.p.m., 0.005 in. feed. For regular production the speed was set at 996 r.p.m., 0.005 in. feed. In 1919 the drill quality dropped. Symbol *D* failed at 1,051 r.p.m. but in 1920 the quality of nearly all the drills improved; *D* failing at 1,178 r.p.m. so that the standard was set at 1,020 r.p.m. and 0.006 in. feed. This increase made a very substantial reduction in drilling costs.

So far this year all the drllis show better tha any time since 1916 when the record was started. The r.m.p. linse are followed during the year in lead pencil and at the end of the year are inked in. The following figures show the improvement in 19/64-in. drills in six years, the figures under the years being the number of r.m.p. at which drills of various makes failed:

	1916	1921
A	970	1,018
B	991	998
C	978	1,002
D	999	1,191
E	956	1,054

The record card shows how the quality dropped in *A*, *B*, *C and E* in 1917 and 1918; in 1916 all five makes of drills were in the 900 r.p.m. class, but in 1921 only one drill was in that class, three—*A*, *C* and *E*—were in the 1,000 r.p.m. class, and one *D* in the 1,100 r.p.m. class.

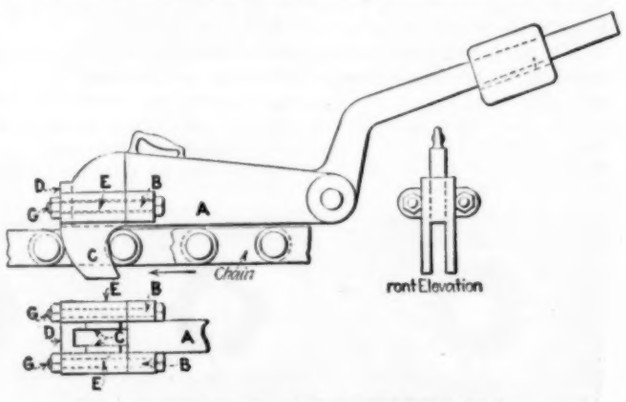
A drill manufacturer told me that drill perfection has not yet been reached and coming years will see further increases in efficiency. When the drill performance record becomes more in use by manufacturers it will help push all drill makers to producing better drills; and the drill buyers will have a practical guide to follow other than the purchase price.

Improvement in Draw-Bench Hooks

BY M. E. DUGGAN

A draw-bench hook is generally a steel casting in which the body and the hook are in one piece. The heavy body is pivoted at the rear end and counterweighted. The hook is designed to stand up under a pull-load at, or a little above, the normal. If it breaks, an entire new casting is required.

In the hook shown in the accompanying sketch, the body *A* and lugs *B* are in one piece. The hook proper, shown at *C* is made of slab sides connected at the ends



AN IMPROVED DRAW-BENCH HOOK

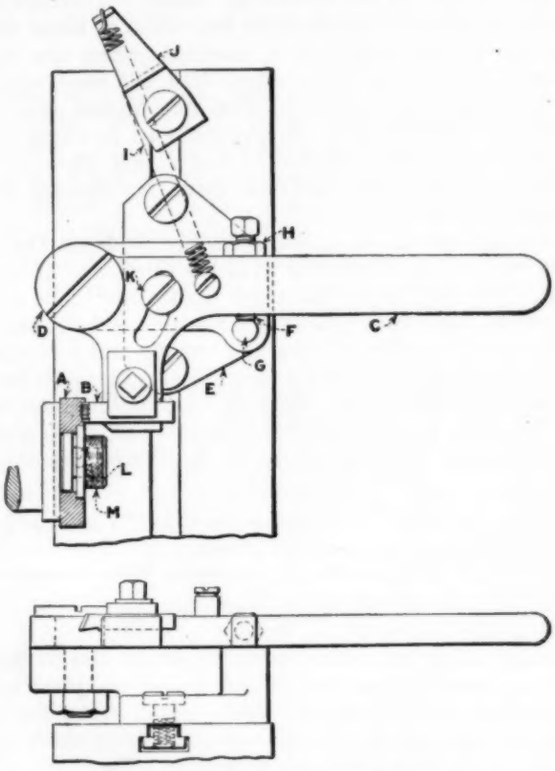
by the part *D*, of which the lugs *E* are an integral part. The bolts *G* answer the double purpose of clamping the hook to the body and acting as a safety factor. They should be the weakest members in the combination so they will be the first to break if the hook is overloaded. In case of breakage, a pair of new bolts will repair the damage.

Cross-slide Finishing Tool

By S. N. Bacon

The illustration herewith shows a tool that largely increased the output of the screw machine to which it was attached and at the same time made the work easier for the operator.

The work was a drop-forged aluminum washer shown at *A* in Fig. 1, and the operation was the turning of a



A CROSS-SLIDE FINISHING TOOL

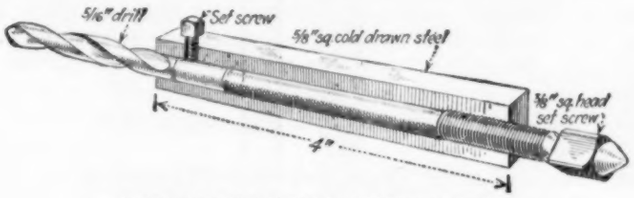
series of grooves in one face. The formed cutter *B* is clamped in the machine-steel holder *C* which pivots on the large shoulder screw *D*, fastened by a nut to the cast-iron base *E*. The slight inaccuracy resulting from the circular feed caused by variation in feeding against the stop in *G*, is negligible on such a shallow cut. The adjusting screw *F* is locked by the check nut *H*. The tension spring *I* for returning the cutter from the work is fastened to the clip *J*, bolted to the cross-slide. The shouldered screw *K* through the slot in the handle, acts as a stop for the return of the cutter and holder.

The end of the work arbor carries the hardened pin *L* which fits in the spiral groove in knurled nut *M*, providing a quick-acting clamp. A fixture of this kind is valuable in any production shop and may be used for various jobs, cutters being made to suit the different varieties of work performed. Unless the fixture is to remain on the machine the spring clip *J* should be fastened to the base of the fixture.

Home-Made Semi-Ratchet Drill

By W. D. Lasall

I had to drill out a broken stud in a place that was too narrow to allow the use of my ratchet drill. To overcome the difficulty I took a piece of ⅝-in. square



HOME-MADE SEMI-RATCHET DRILL

cold-drawn steel, 4 in. long, and drilled a 7/16-in. hole through it lengthwise. I then tapped one end for a ⅜-in. screw. The drill was inserted and held in place by a set screw while a screw at the end with a pointed head, acted as both a center and a feed screw. By using a wrench, with offset opening on the holder, I was able to get one eighth of a turn of the drill before reversing the wrench. The sketch herewith shows the device.

Design and Construction of Dies for Stamping Sheet-Metal Products

By James Richard Ewing

The dies illustrated herewith are both what are known as combination dies, that is, dies in which blanking, forming, piercing and embossing operations are performed at one stroke of the press.

The die shown in Fig. 1 is for stamping a washer used in great numbers by automobile builders. This washer is used for retaining and packing felt or leather around shafting or ends of bearings to keep out foreign substances and to help keep in the oil which would otherwise have a tendency to leak out.

This die, although complicated as to construction especially for the production of the part made, is very serviceable and should last for twenty thousand pieces.

Part *A* is the punch holder proper and is made of

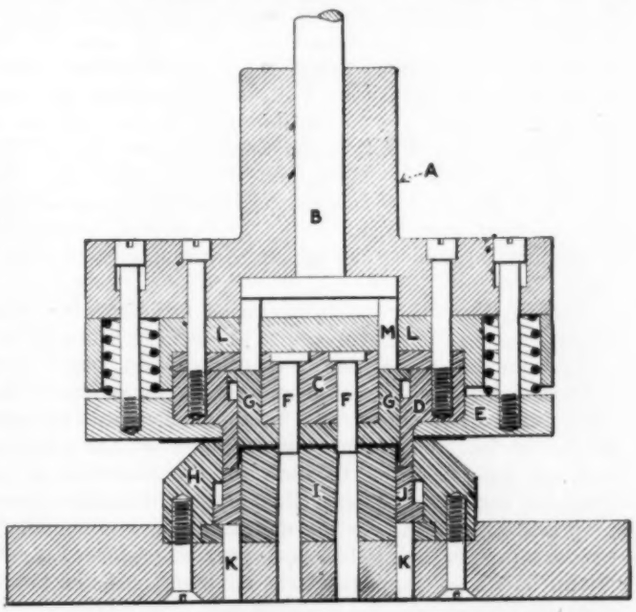


FIG. 1. COMBINATION DIE FOR RETAINING WASHERS

machine steel. The hole in the center is for the knockout rod and must be a few thousandths over size to allow for a sliding fit for the rod. The knockout rod is enlarged at the lower end and this part acts as a bearing for the ends of the four small knockout pins *N*.

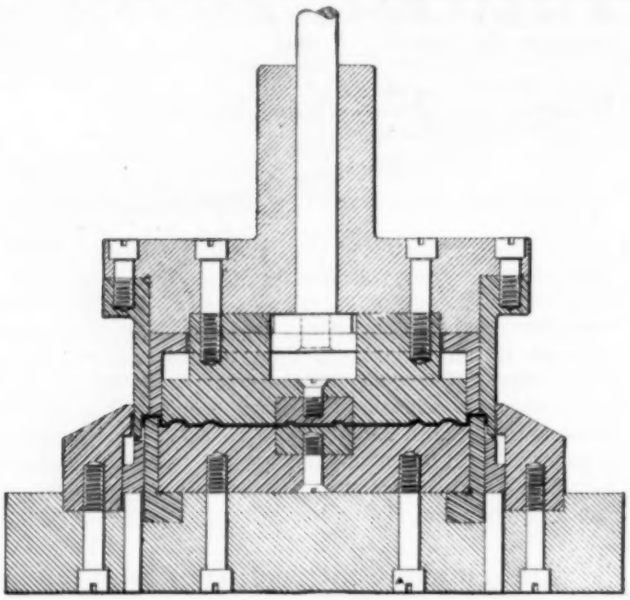


FIG. 2. COMBINATION DIE FOR CAN BOTTOMS

Part *C* is the punch holder for the four piercing punches *F* and is made of tool steel. The piercing punches are made of high-speed steel ground flat on the punching end. High-speed steel punches seem to stand up better for this class of work than carbon steel. Part *D* is the punch ring and is drilled and tapped for four fillister head screws which pass through the punch holder, the spring plate, the piercing punch holder and are screwed into the punch ring to hold the various parts together.

Part *F* is a machine steel pressure plate and has an up and down motion of about $\frac{3}{4}$ in. This plate comes in contact with the metal to be stamped and holds it firmly in place during the complete operation. As the punch continues to descend it bends the edge of the blank down and thus forms it to the required shape. While the punch yet lacks $\frac{1}{4}$ in. of being down, the four piercing punches get in their work. At the bottom of the stroke, part *G* is forced down on the blank with enough pressure to flatten out all irregularities. On the up stroke, part *G* acts as the knockout to remove the washer from the punch.

The cutting end of the punch ring is drawn to a dark straw color.

Part *H*, the cut ring, is hardened and drawn so that it tests out on the scleroscope to about 90. It should not vary from that more than two points either way.

Part *I* is the die center and must be made to the diameter of the washer. The four holes in this part are 0.003 in. larger than the diameter of the punches and are tapered 4 deg. to allow for the clearance of the slugs as they drop down. Part *J* acts as both a draw ring and knockout. As the metal is placed over the die preparatory to being blanked, part *J* is forced up to within $\frac{1}{32}$ in. of the edge of the cut ring. As the blanking punch descends, the metal is held firmly between the bottom of the blanking punch and the top of the draw ring. On the up stroke the draw ring follows the punch and acting as a knockout throws the finished washer from the die. This ring is forced up by a pressure plate beneath the bolster.

The die shown in Fig. 2 is used in stamping ends for sanitary tin cans. Its construction and operation is so near like that of the first mentioned die that no additional comment is needed.

Repairing a Broach with Solder

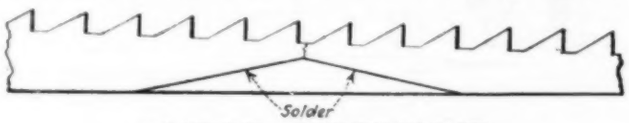
BY GEORGE WILSON

Many mechanics do not realize the possibilities of ordinary soft solder, our old friend "half and half," when it comes to putting metal parts together. Most of us think of soft solder in connection with leaky tinware and similar work. But under the right conditions it can be substituted for brazing or welding.

The sketch shows a broach repair. Through carelessness and accident we have had three of these broken on the return stroke of a machine, when the broach would stick in the work which had not been removed, or in some other unexplained manner known only to the operator. The broach usually snapped in three pieces, and as we always needed it badly just then and the maker charged $27 each for them, we decided to try repairing them.

The broach is 24 in. long by $\frac{1}{4}$-in. wide on the back. The cut is $\frac{1}{8}$ in. Welding with the torch was first tried, but this mutilated the teeth and drew the temper. Brazing was also tried, and while this did not mutilate the teeth so badly, it drew the temper and a tempering warped the broach. As a last resort soft soldering was tried with results that were all that could be desired.

The ends of the pieces were scarfed off for a distance of about an inch, as shown in the sketch, leaving just



SOLDERING A BROKEN BROACH

enough stock below the teeth to prevent the tooth from breaking off under the cutting strain. A piece of soft steel was then fitted into the scarfed ends, the splice being large enough to allow for finishing down to the size of the broach after soldering. The ends of the broach and insert were tinned with a soldering iron and pressed together while being heated with a gasoline torch. A piece of keystock clamped over the teeth and along one side served to hold the hub in alignment. The heat required to melt solder does not affect the temper.

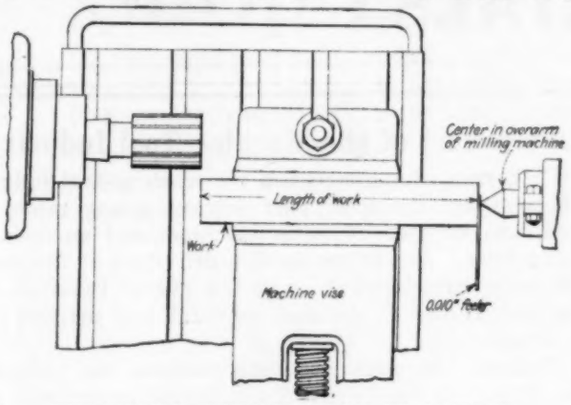
Another use of soft solder is in putting extension shanks on drills or taps where a chuck would strike some projection on the work or jig. A piece of cold rolled makes a nice shank. Drill one end to receive the shank of the tap or drill, tin both parts and slip them together when hot. When the tool is worn out or broken, a new one can quickly be put in place.

Milling Work to Exact Length

BY R. F. MOORE

Having a number of pieces of machine steel about 10 in. long, which had to be milled to exactly the right length, I started looking for a way to rig up a stop which would do away with measuring every piece

separately. I accidentally hit on the idea shown in the sketch. I first squared off all the pieces on one end then carefully milled one piece to the exact length,



SET-UP FOR MILLING WORK TO LENGTH

using a vernier caliper to measure it. Leaving the cross-slide locked, I pulled out the over-arm and brought its center up against a feeler held against the end of the work. I then locked the over-arm, but noticed that locking it shifted its position; so I took a babbitt block and rapped it until the feeler just fitted between the work and the center.

I then took the finished piece out and replaced it with another, locating it against the feeler and center as before.

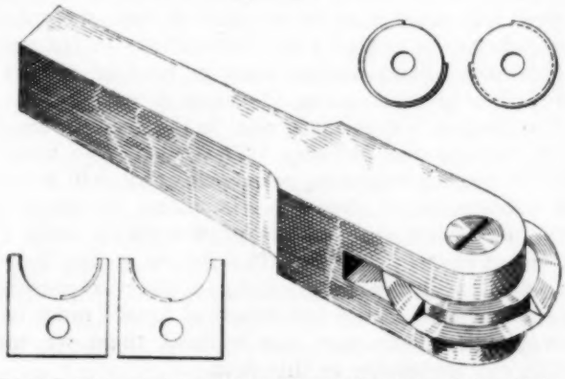
Tools for Finishing Hemispherical Surfaces

BY WILFRED H. BROWN

The sketch shows a set of tools designed by the writer, originally for the purpose of finishing the valves and seats of a pneumatic hammer made by the Pneumatic Tool and Machine Co., Petrograd, Russia, and later in this country applied to the making of molds for tennis balls. Accuracy of contour and smooth finish were essential in each case; less than 0.001 in. tolerance in size and sphericity being allowed.

The cutting blades were ground to size and shape after hardening and, so perfectly did they do their work, no finishing operations were necessary except to polish the hardened parts with various grades of emery cloth.

Two cutters were placed face to face in the holder as shown. The bulk of the metal was, of course, removed from the stock by means of a tool held in the slide rest in the ordinary way.



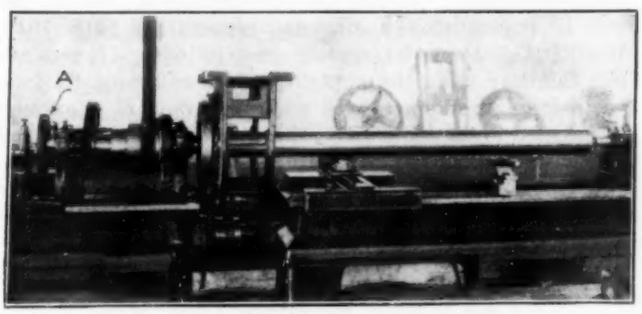
TOOLS FOR FINISHING HEMISPHERICAL SURFACES

Resourcefulness Versus Equipment

BY CARL H. BRIGGS

At the New London, Conn., Vocational High School, each graduating class is required to build, as the culmination of its training, some particular machine or device needed in the school's shop. Included in the products of the graduating classes are a 5-hp. electric motor, a hand milling machine, a gasoline marine engine, four bench drilling machines, a number of machinists' vises and a twin-wheel tool grinding machine.

In building the electric motor it was found that no lathe of sufficient swing was available for boring out the frame. The piece was finally machined in the manner shown in the illustration. Two lathes were placed close together, end for end, and carefully lined up. The headstock of one lathe (shown at the left in the illustration) was turned around and the motor frame mounted on the faceplate and arranged to swing between the ends of the two machines. The headstock of the lathe at the right was removed and the boring tool mounted in the toolpost. The long steel bar shown in the illustration was swung between the headstock of the first lathe and the tailstock of the second lathe, in order to minimize the vibration. With the two machines arranged in this manner the motor frame was bored out, thirty minutes being required for the operation. Another interesting operation was performed at the same set-up. This particular size motor has eight slots in the frame for retaining the field. In machining



HOW THE MOTOR FRAME WAS BORED BY USING TWO LATHES SET IN TANDEM

these slots a sort of hand broaching process was employed. At the time this motor was built the school was in an early stage of development and did not possess a shaper or a slotter, so that further improvision was necessary to complete the piece. A grooving tool was clamped in the toolpost of the machine at the right, and the carriage actuated back and forth by means of a long lever operated by hand with one end secured to the floor. Feeding the tool for the proper depth of slot was accomplished by means of the cross-slide movement, the slide being adjusted to allow the tool to cut several thousandths deeper at each pass. Indexing was accomplished by means of a gear mounted on the rear end of the headstock spindle of the lathe at the left. This gear is shown at *A* in the illustration. The teeth of the gear were filled with wax. Each tooth space coinciding with an eighth of the circumference was cleared of wax, and the indexing positions maintained by means of a piece clamped in the toolpost and meshing successively with each clean tooth space.

EDITORIALS

More Relief for the Taxpayer

DON'T fail to read the short article on amortization which appears on another page. It tells of the possibility of filing amended returns for the years from 1918 to 1921, in which claims for amortization of equipment to a present replacement cost basis may be entered.

We do not pretend to know much about income and profits tax matters, but wo do know enough to consult expert advice when the occasion for it arises. Hence the three amortization articles which appeared some weeks ago, all written by experts on the subject, and the present article telling what the recently issued Treasury Department Regulations 62 mean, and bringing the information on income tax procedure up to date.

From the manufacturer's point of view, our internal revenue laws leave much to be desired, and particularly, the act of 1921 from which too much was expected. Of course, the ultimate consumer is the real sufferer in the end, but the blow reaches him in such a way that the blame for it falls more upon the producer than upon the law and the men who passed it, where it really belongs.

On the other hand the 1921 law does leave a loophole through which some light reaches the harrassed manufacturer. Claims for amortization deductions may be made through amended returns for 1918, 1919, 1920 and 1921 under certain restrictions. If you are not familiar with the contents of Regulations 62 take the matter up at once with your tax adviser. You may be entitled to no additional relief, but if you are justified in claiming some it will probably be well worth the effort. Many a plant has made entirely inadequate amortization claims and will benefit greatly by taking advantage of the new rulings.

Call Money Becomes Plentiful

DO YOU believe in signs? We do, in certain ones. Take a ladder, for instance. We admit to a superstitious dislike of walking under one, particularly if there is a painter on it. Seriously, however, there is a sign in Wall Street that we thoroughly believe in. Call money closed at three per cent one day last week and there was a report that ten millions had been loaned outside at two and a half.

If you are looking for signs of returning business here is a fairly reliable indicator. When men have so much money that they will lend it at three per cent or less it is reasonably certain that they are in buying mood and that business is better and will soon be good.

The low money rate also indicates that a definite point in the business cycle has been reached where liquidation is practically complete and recovery has commenced. Our friends, the economic prognosticators, point with pride to this sign, not only as a good omen for the future, but as proof that the prophecies made for better business this spring are on the point of realization. As for us, we are more than willing to listen with patience to their "I told you so" song.

Personnel of the Machine Tool Industry

THE men who established the machine-tool industry were for the most part earnest young mechanics who saw the need of better machines and methods for doing work. Conditions in the early days of the industry were very different as to the capital required, and the fluctuations in demand were far less marked than at present.

Without the work of these pioneers the industrial supremacy of the United States would never have been accomplished. Interchangeable manufacture is directly due to the design and quality of the machine tools which they developed. It could not have been accomplished in any other way.

If our industrial supremacy is to continue we must have a real incentive for the younger engineers to devote their lives to this side of manufacturing problems. The condition of the machine-tool industry has not, however, offered much material encouragement to young men, no matter how much they may have been interested in that line of work.

This has been partly because the industry has never been able to pay the salaries which the same young men readily secure in other lines. As evidence we have only to note how the bicycle and the automobile industries have attracted the best men by salaries which few machine-tool concerns could or would pay. The other reason is that it is difficult for the proprietor who has struggled up from day wages to appreciate the changes which have come over all industry. He cannot see why the young man of today is not content to work as long hours and for as little money as he did.

The machine-tool industry must be brought up to a higher standard. It must be made attractive to the best mechanical minds of the country. Engineering ability and genius applied to machine tools affects and improves all manufacturing, whereas if applied only in one of the manufacturing lines its usefulness is more limited.

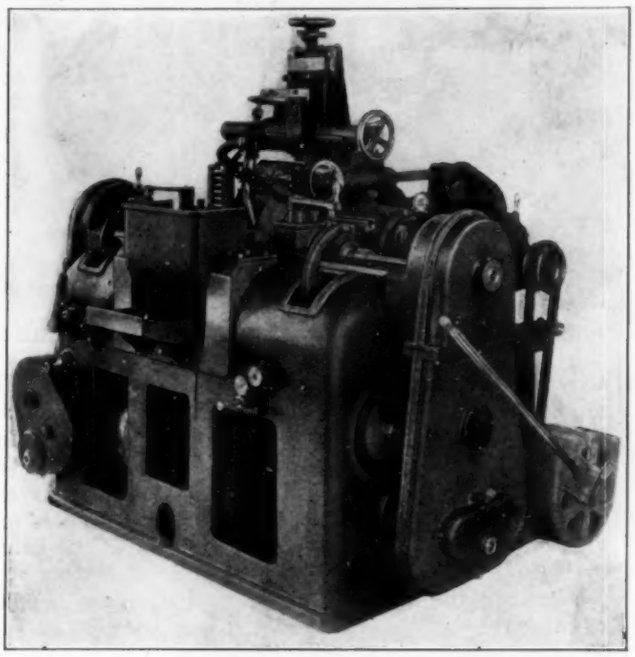
The machine-tool shop which is not so organized as to attract bright young mechanics and to retain them, cannot hope to become or remain an important factor in the industry. And when, as at present, there is very little in the whole industry to attract the best brains and skill, not only is the industry itself in a bad way but the manufacturing supremacy of the country is in danger. It must also be recognized that the machine tool industry is one of great fluctuations in the volume of business. Slack periods must be bridged over if the industry is to continue, as of course it must.

The danger is even more vital to the users of machine tools than to the builders. The buyer who makes it difficult for the maker to get a price that will maintain the industry as it should be, is killing the goose that lays the golden eggs of the profits which come from low manufacturing costs. The future of the industry depends largely on maintaining a superior personnel. Designers with fertile but practical brains must be encouraged in every way, for without them we cannot retain our leadership in this field.

Shop Equipment News

Fraser Automatic Cylindrical Grinding Machine

The machine shown in the accompanying illustration is intended for grinding cylindrical parts held on centers and having diameters larger than ½ in. It is a fully



FRASER AUTOMATIC CYLINDRICAL GRINDING MACHINE

automatic, plain grinding machine recently placed on the market by the Warren F. Fraser Co., of Westboro, Mass. The principal features of the machine are the simplicity of construction and the speed of operation. It is adapted particularly to grinding shafts, bolts, valve tappets, piston pins and similar work. The maximum length of the grind is 6 in., while work up to 10 in. in length may be held between the centers. If desired, the work may be held in draw-in chucks.

The weight, which is approximately 7,000 lb., is stated to aid the performing of operations with smoothness and accuracy. The grinding wheel is 18 in. in diameter and can be used in face widths up to 6 in. Lubricant is forced to all bearings.

The machine is entirely self-contained and run by a 15-hp. motor through a 4½-in. belt. If desired, it may be driven by means of either an overhead countershaft or a constant-speed pulley. The machine controls are easily accessible to the operator. One operator can handle as many as four machines on certain work.

The automatic operation enables production at high speed. It is stated that on piston pins ⅞ in. in diameter, and 3¼ in. long, a production rate of five per minute was obtained. The machine requires no more time to set up for an operation than ordinarily required for an automatic screw machine, and usually less time is taken.

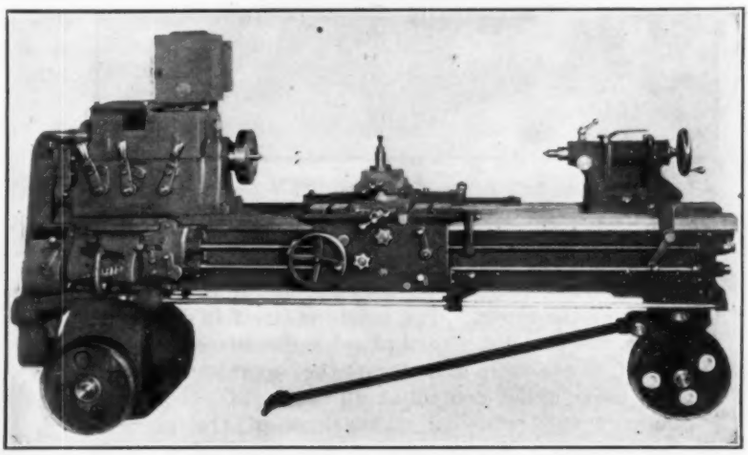
Lehmann Portable Motor-Driven Geared-Head Lathe

The Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo., has just brought out a geared-head engine lathe of the portable type, especially adapted for use in railroad shops and in plants doing large work where it is desirable to bring the tool to the job. The lathe, shown in the accompanying illustration, is built in two sizes, having 18¼ and 20¼-in. swings respectively. It is driven directly by a 1,800 r.p.m. motor through a belt tightened by an idler pulley. The motor is mounted in the cabinet leg under the headstock. The pulleys and belt and all working parts are fully covered by metal guards.

The headstock provides sixteen spindle speeds in almost geometrical progression with the use of only ten gears, all of which are heat-treated. The headstock housing forms an oil-tight case for all running parts. The spindle is hardened and runs in phosphor-bronze bearings. All the other shafts in the headstock run on ball bearings.

The spindle nose has two diameters, one in front and one behind the threads, so as to give firm bearing surfaces for the face and chuck plates. The forward and reverse motion is obtained through friction clutches running in oil. The control handles for the reversing mechanism are located both at the apron and at the head end of the lathe, so as to be always in convenient reach. The clutches require no adjustment, and are capable of transmitting a slightly heavier load than the work requires.

The arrangement of the three wheels and the handle for moving the lathe can be seen in the illustration. The starting box of the motor is mounted on top of the headstock. The lathe has all the features incorporated



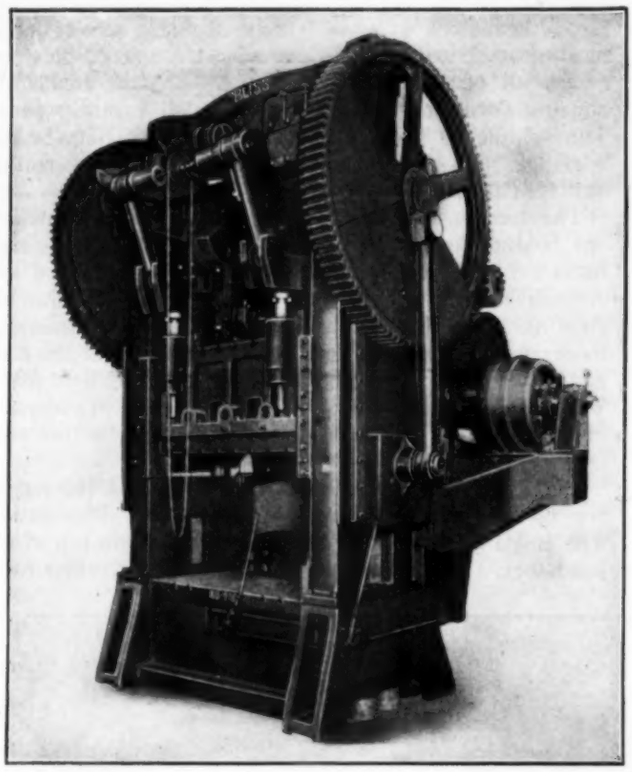
LEHMANN PORTABLE MOTOR-DRIVEN GEARED-HEAD LATHE

in the regular line of Lehmann machines, being equipped among other features with a quick-change mechanism, locking device for the tailstock spindle and a rod and screw shift. Mounting the motor under the bed does not increase the width, so that the machine can be moved through narrow aisles.

Bliss Double-Crank Toggle Press

The accompanying illustration shows a large double-crank toggle drawing press recently built by the E. W. Bliss Co., Brooklyn, N. Y. The press is intended for drawing pressed-steel axle housings for automobile trucks, the material worked on being $\frac{3}{8}$ in. thick. The machine is also applicable to the making of heavy stamping of all types. It is of the tie-rod construction, is twin driven and triple geared. The ratio of the gearing is 65 to 1, and all gearing in the driving train is of steel with machine-cut teeth.

Power is transmitted from the main driving gears to the outside slide or blank holder through a series of toggles on which a dwell of 120 deg. is obtained. The drive to this slide is at both ends of the press, the same arrangement being employed for the inner slide. The small number of connections or links used in transmitting the power to the outer slide requires the consumption of only a small amount of power in the mechanism itself, and gives a simple and sturdy construction.



BLISS DOUBLE-CRANK TOGGLE PRESS

To reduce wear at the joints, the connecting pins are hardened and ground. The adjustment of the inner slide or plunger is made by a 15-hp. motor mounted on the front of the crown. The machine itself is driven by a 100-hp. motor. By means of a hand-actuated friction clutch of the double-grip type, the operator has the moving parts under control at all times.

Some of the principal dimensions of the machine are as follows: The stroke of the inner slide is 28 in., while that of the outer slide is 20 in. With the stroke movement down and the adjustment up, the distance from the bed to the inner slide is 59 in., and from the bed to the outer slide 56 in. The bed has an area of 60 x 116 in., the face of the blank holder of 60 x 102 in., and the face of the plunger of 36 x 86 in. The machine weighs about 600,000 pounds.

Davis-Bournonville Tube-Bending Machine

The Davis-Bournonville Co., Jersey City, N. J., has recently developed the machine shown in Fig. 1 for bending light tubing to special shapes. The bending is

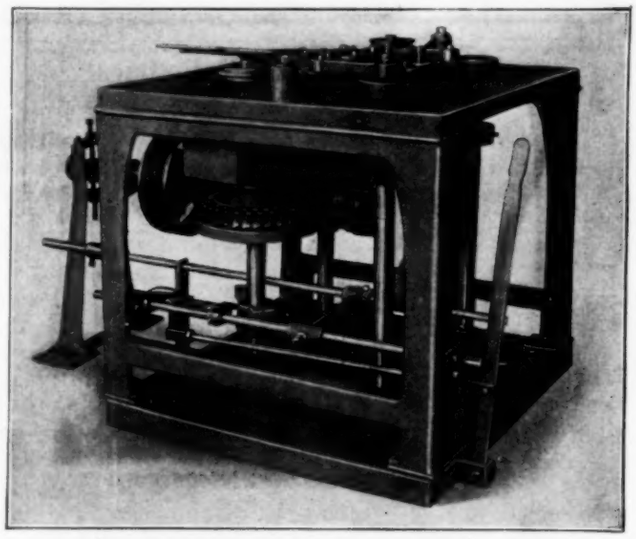


FIG. 1. DAVIS-BOURNONVILLE TUBE-BENDING MACHINE

accomplished by means of two arms or cranks on the top of the table actuated by vertical oscillating shafts. Various arrangements of links and rollers can be applied to the arms, so as to give the form necessary. The vertical shafts are driven by means of worm gearing and a crank motion underneath the table. A clutch is provided for starting and stopping. The machine is driven by belt on a pulley that normally runs at 300 r.p.m.

Although the machine can be applied to the bending of small tubing into any desired shape, it is here adapted to bending a $\frac{7}{16}$-in. 22-gage steel tube to the shape required for the frame of a tennis racket. Two operations are required. In the first operation the tube is bent around a form so as to form the bends at the throat of the racket. The straight tube is inserted at the right of the form, while the arms are drawn back to provide clearance. By means of pins and rollers mounted on the levers, the tube is bent into a smooth curve.

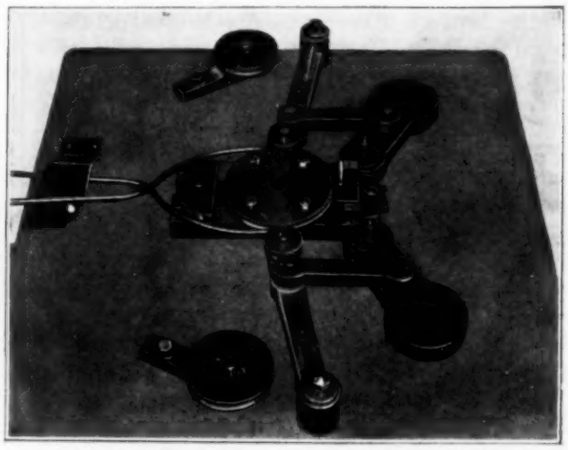


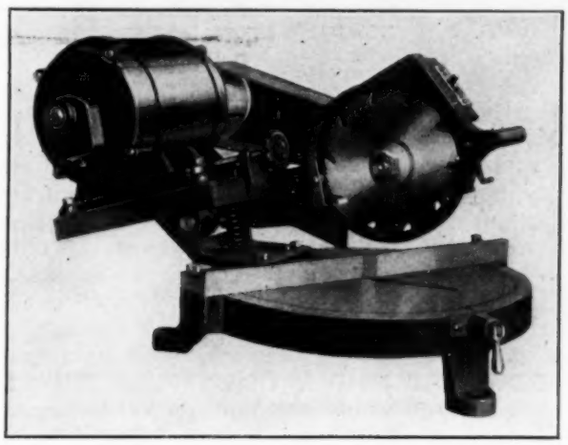
FIG. 2. FINAL OPERATION IN BENDING RACKET FRAME

After a lot of the frames has been given the first operation, the bending tools are changed to those shown in Fig. 2. The rollers on the ends of the cranks are removed and links are connected to the studs on the arms,

so that two small swinging arms can be actuated. The large rollers serve as locating stops. The tube is put in place with the linkage moved to the right, and then the machine bends the tube around the form so that the top of the racket is shaped. One leg of the frame passes under the clip at the left, while the other goes over the top of it. It is necessary that the frame be bent to a greater angle of curvature than desired, in order to overcome the spring and to set the metal to shape. It is stated that 600 to 1,000 bends per hour can be made.

Tannewitz Portable Bench Saw

The accompanying illustration shows a small portable bench saw recently placed on the market by the Tannewitz Works, Grand Rapids, Mich. The machine is motor-driven and self-contained, and is adapted particularly to light work in cutting and fitting wood parts. The base of the machine carries a one-piece table, upon which the motor and saw are mounted. It is possible to swing the table and saw to any angle up to 45 deg. in either direction. This feature is of use particularly in cutting molding for miter joints. The motor and the saw are mounted on a frame that swings about a horizontal axis. A coil spring serves to keep the saw normally in an elevated position. The motor is belted to the saw arbor, and a screw adjustment is provided for varying the tension of



TANNEWITZ PORTABLE BENCH SAW

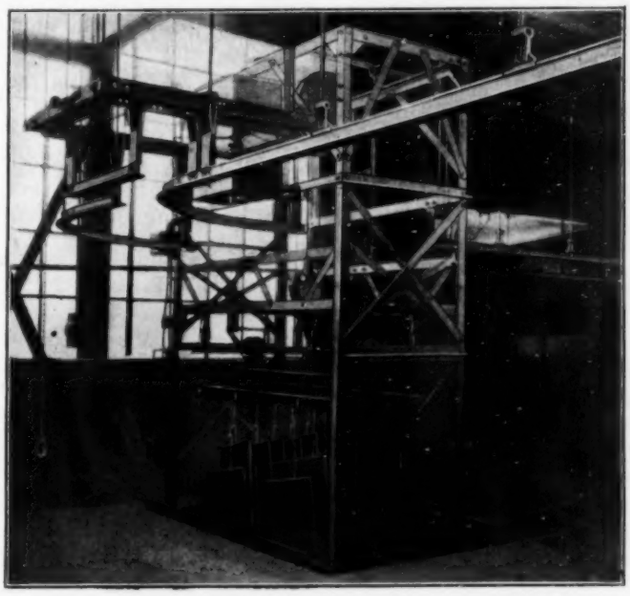
the belt. Both the belt and the pulleys are covered by a metal guard. The saw itself has combination teeth, that is, both large and small.

The saw is covered by a metal housing, at the front of which is the handle for depressing it. But one hand is required for manipulating the saw, so that the other hand of the operator is free to control the work. A switch near the control handle serves for starting and stopping the motor. The bottom of the saw is protected by a metal guard on each side of it. When the saw is raised, this guard is locked in position, so that the work cannot be put in contact with the saw teeth accidentally. Before making the cut, the operator unlatches this guard with his right forefinger, so that the saw can be fed downward while the guard merely rests on top of the work.

A spout placed at the rear of the saw carries off the dust, so that it is not thrown in the operator's face. A permanent gage for positioning the work is secured on the stationary bed. The swiveling table can be locked in any position desired, and it is also possible to lock the saw at any height.

Cleveland Hand or Electric Tramrail Elevator

The elevator shown in the illustration has just been developed by the tramrail division of the Cleveland Crane and Engineering Co., Wickliffe, Ohio, to facilitate



CLEVELAND TRAMRAIL DIPPING ELEVATOR

the dipping of materials in tanks or vats in conjunction with painting, japaning, pickling or boiling operations, where hand or electric tramrail systems are used. The elevator forms a section of the tramrail system itself, in that the carriers loaded with the materials to be dipped are run onto sections of track attached to the elevator platform, which is then lowered into the solution.

The size of the elevator depends on the size of the tanks or vats employed, while the height is regulated by the height of the tramrail from the floor and by other existing conditions. The structural steel angles for the elevator shaft are riveted and braced with gusset plates, angles and cross braces, to provide a structure rigid enough to handle all weights in the capacity of the tramrail itself.

A one- or two-ton electric hoist, fastened to cross members at the top of the elevator frame, furnishes the motive power for raising and lowering the platform. Air hoists can be used instead, if electric power is not available or if greater speed is required. The electric hoist can be arranged with a push-button switch located on the elevator frame. The control is automatic in operation, since it requires only pushing the button to start lowering the carrier into the tank. The control stops the load at its lowest position, holds the materials in the solution for any predetermined length of time to which the control is adjusted, and then returns the load to the original position with the movable section of the rail in line with the stationary tramrail.

The carrier can be pushed off the elevator platform on to the tramrail proper, allowing the dipped materials to be placed in position over the dripping pans.

A riveted structural steel framework composes the movable section of the elevator. The corner angles fit loosely inside the corner angles of the shaft, which form a guide for lowering and raising the platform. Any

number of sections of tramrail corresponding with the stationary system, are located on the bottom of the platform and suspended by suitable hangers. Fingers are dropped over the movable rail sections to stop the carrier wheels at the proper position for lowering the materials into the tank. When the elevator rail is lowered, similar stop fingers fall into place on the ends of the open rails leading to the elevator. This automatically prevents other carriers from over-running the open ends of the rails.

The elevator platform is suspended from the hoist sheave block by a compression spring to reduce shock that may be caused when the materials are being raised. The load is steadily lifted without agitating the solution or causing any undue shaking of the dipped parts.

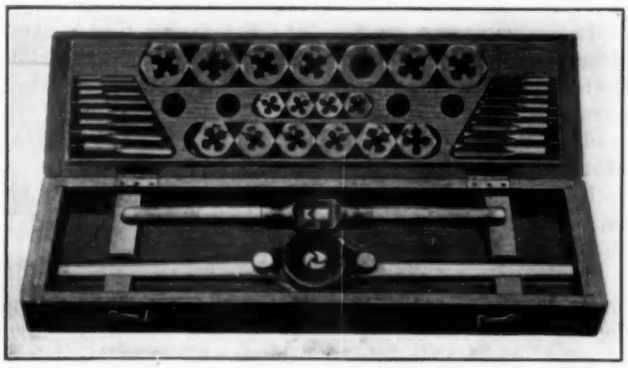
Wells Screw-Plate Set

The Frank O. Wells Co. Inc., Springfield, Mass., has recently placed on the market the screw-plate set shown in the accompanying illustration. The stock for holding the dies is made of an aluminum alloy, so as to have both lightness and strength. The tap wrench is made of steel with hollow handles and is 15-in. long. The dies are all of hexagon shape, and are adjustable as to size. This adjustment is accomplished by turning a fillister-head screw fitted in the side of the die that has a saw-cut through it. Since the tendency when cutting is to force the die outward, the screw merely serves to draw it together to the size desired.

It is not necessary that the die always be used in the stock, as it can be turned by an ordinary socket or open-end wrench, so that it can be employed in close quarters. It can be applied on a screw machine, as it aligns itself readily. The cutting edges of the die are of standard form and have large chip clearances, so that they are suited to cutting thread from the solid and not merely to re-threading. The cutting faces are formed by broaching. The dies are reversible, so that they cut with either side up.

The die stock is provided with an adjustable guide held in place by two knurled-head screws. When the screws are loosened slightly, the guide can be swung to one side so that the dies can be changed. When the screws are tightened, the guide is held in position over the center of the die, and the jaws of the guide are locked in place. An adapter or collet of hexagon form is furnished, so that dies of small outside diameter may be held in the same stock.

This No. 300 set includes eight dies from $\frac{1}{4}$ to $\frac{3}{4}$ in. in size, in both U. S. S. and S. A. E. forms of thread. There are eight U.S.S. taper taps and eight S.A.E. plug taps. The complete set is packed in a wooden case.

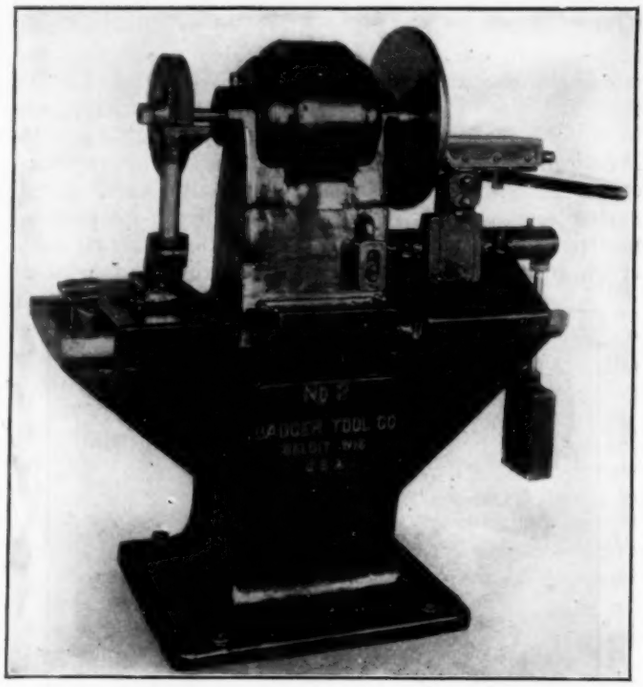


WELLS NO. 300 SCREW-PLATE SET

Badger No. 2 Grinding Machine

The illustration shows the No. 2 grinding machine recently placed on the market by the Badger Tool Co., Beloit, Wis. While various forms of equipment are applicable to this machine, it is here shown with the right end equipped with a 16-in. disk wheel faced with a "Diacarbo" abrasive disk $\frac{3}{4}$ in. thick. This disk is served by a universal lever-feed table. The left end of the spindle is extended to receive a 12-in. solid grinding wheel served by an adjustable work rest.

The 3-hp. G.E. motor is fitted with special end frames and S.K.F. ball bearings for both radial and thrust loads. The motor is fully enclosed and has forced ventilation, with the current passing down through the



BADGER NO. 2 GRINDING MACHINE

machine pedestal. A push-button station and automatic starter are furnished. The weight complete is 1,300 pounds.

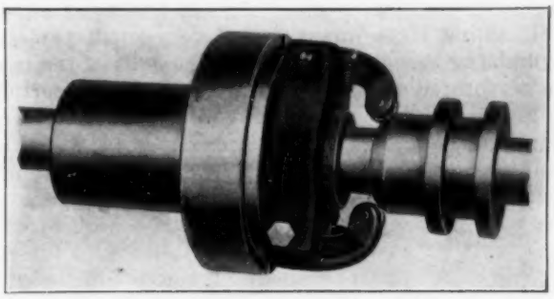
Carroll Extended-Sleeve Clutch

The accompanying illustration shows an extended-sleeve friction clutch that has recently been placed on the market by the L. W. Carroll Manufacturing Co., Batavia, Ohio. The clutch is intended especially for the driving of wood, steel or cast-iron pulleys, gears, sprocket wheels or such parts placed on the sleeve. It consists of but few parts, and is compact in construction.

The friction disk is of large diameter, which permits of a strong, uniform grip capable of fine adjustment. The spider is keyed to the shaft, or held by a hollow set-screw. The clutch can be erected by merely sliding it on the shaft and tightening one screw. No extra collars are required to hold it together, and it is not necessary to compensate for end thrust.

In order to adjust the friction, it is necesary to turn only one nut, which automatically adjusts the tension for both of the fingers. The clutch is intended to run under hard usage with practically no wear and without noise. It may be placed on the line shaft, so that it

drives directly to the machine without using a countershaft. In this way, considerable space and belting are saved. When used as a cut-off coupling, it enables the



CARROLL EXTENDED-SLEEVE FRICTION CLUTCH

stopping of one group of machinery without interfering with the others, and it eliminates the shifting of belts on tight and loose pulleys to engage or disengage a section of shafting. The bearing end of the shaft runs in a bronze bushing that is supplied with oil from the chamber around the bearing.

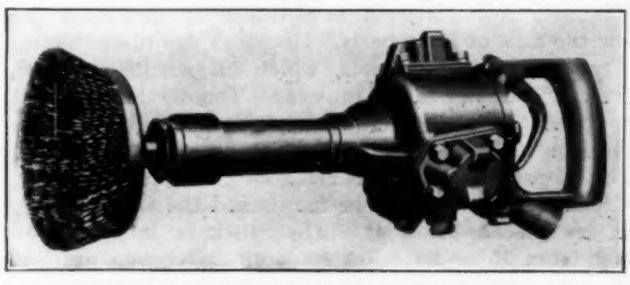
The clutch may be furnished in six sizes, from 5 to 12 in. in diameter. At 100 r.p.m., the horsepower transmitted is 2 to 13, depending on the size. The sleeves are 5 to 6 in. in length.

Ingersoll-Rand "Little David" Wire Brush

The Ingersoll-Rand Co., 11 Broadway, New York, N. Y., has just brought out the No. 601 "Litle David" air-driven wire brush illustrated herewith. The tool is especially intended for removing paint, rust, dirt and scale from tanks, cars and structural steel forms where the area to be cleaned is large and fast work is required. Its chief feature is the speed at which the brush rotates, a point which is stated to enable faster working and to give long life of the brush under severe service. The device differs from the "Little David" brush described on page 1,021, Vol. 54, of AMERICAN MACHINIST, in speed primarily, although it carries a larger brush.

The air motor is of the three-cylinder type, so that all parts are balanced and the machine operates without vibration. Light weight is obtained by using an aluminum casing reinforced with cast-in steel bushings. The complete machine weighs only 14 lb. The average free speed of the brush when operating on 90 lb. per sq.-in. air pressure, is 4,200 r.p.m. The diameter of the brush itself is 6 in., and the length of the tool overall is 17½ inches.

It is stated that on a prolonged test of the brush, steel gondola cars averaging 540 sq.ft. of surface were cleaned in 3½ hr. each. All-steel box cars having 1,400 sq.ft. of surface each were cleaned in 7½ hr. Not only rust, but old paint as well, was removed.



"LITTLE DAVID" No. 601 WIRE BRUSH

Blount Speed Lathe with A.C. Motor Headstock

In the accompanying illustration is shown a 12-in. swing speed lathe for bench mounting that has recently been placed on the market by the J. G. Blount Co., Everett, Mass. The lathe is intended especially for wood turning in manual training schools and in pattern shops.

The principal feature of the machine is the fact that a ½-hp. alternating-current motor is mounted directly on the spindle of the headstock. The spindle is made of 45-point carbon steel, has a hole ⅝-in. in diameter throughout its entire length, and a No. 2 Morse taper hole for the center point. The spindle nose is 1¼-in. in diameter and has ten V-threads per inch. An outside faceplate and pulley combined, 8 in. in diameter, may be employed

BLOUNT A.C. MOTOR HEADSTOCK SPEED LATHE

for belting the motor to auxiliary equipment. The spindle is mounted on S.K.F. radial and thrust ball bearings carried in dust-proof housings. The motor is fully enclosed, so as to exclude dust.

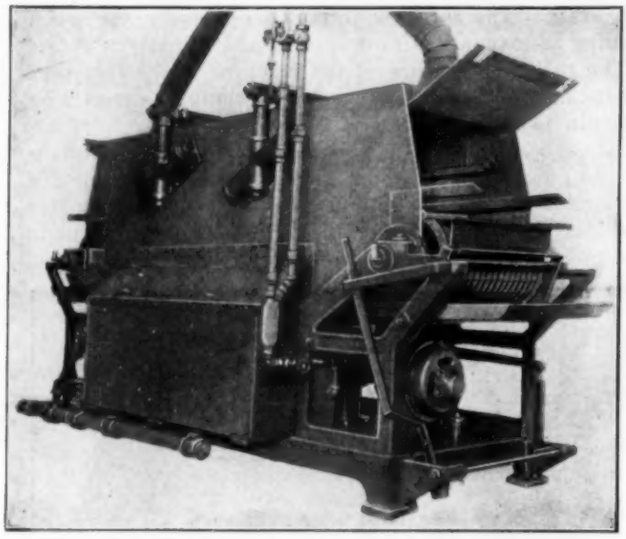
The bed has a flat top and may be supplied in lengths of 4, 5 or 6 ft., the maximum distances between centers for the different lengths being respectively, 25, 37 and 49 in. Short legs for bench use are ordinarily fastened to the bed, although long legs for supporting the bed from the floor can be supplied.

The bed is widened out under the headstock, so as to allow room for the controller. A casting bolted to the leg and to the lower part of the bed serves to fully enclose and protect the starting device. A hand lever on the front of the bed permits of changing the speed of the motor. Four speeds are provided, namely 575, 1,160, 1,750 and 3,450 r.p.m. The wiring between the motor and the controller is, of course, completely enclosed.

A tailstock fitted with an adjustable spindle and a device for clamping it to the bed are provided. The rest holder is clamped by means of a single handle, so that its position may be quickly adjusted. Each lathe is equipped with one spur and one cup center, three T-rests, a 5½-in. faceplate, a 3-in. screw chuck, a knockout rod for the head center and one right-angled rest. Other equipment can be furnished.

Colt "Autosan" Metal-Parts Washing Machine

A machine intended to cleanse screw-machine products and other parts in process of manufacture from the grease, oil, or compound with which they are flooded



COLT "AUTOSAN" METAL-PARTS WASHING MACHINE

during the cutting operations, has been placed on the market by the Colt's Patent Fire Arms Manufacturing Co., of Hartford, Conn., under the trade name of "Autosan." Pieces of work not exceeding 20 in. in width and 14 in. in height can be cleaned in the machine.

The machine is a development of the needs of its manufacturers, whose principal products necessitate the continuous washing of small parts, involving much labor and loss of time when performed by dipping the parts in tanks. The machine illustrated herewith is complete, except for suitable tables to facilitate handling the work. It is entirely self-contained, and requires no auxiliary connections in the way of shafting and belts. Wiring to the motor, and pipe connections to the steam and water supplies and to the overflow, complete the installation.

A linked conveyor belt passes through the cleansing chamber and over drums at the ends, being driven at a constant slow rate of travel by the motor. In the cleansing chamber, the work passes through two separate series of sprays forcibly ejected through small nozzles by a powerful rotary pump that is a part of the machine. Each set of sprays is so arranged as to deliver the jets upon the work from the top, bottom and both sides. The speed of travel can be varied from 10 to 17 ft. per minute, so as to adjust it to conform to the time required for cleansing the work, and to the speed with which the operator can handle and feed the trays to the machine.

The circulating units, consisting of tanks, piping and pump-chambers, are complete and separate from each other, so that a first and second soda solution, or a soda solution followed by a hot-water rinse, may be used. Though the machine shown has but two sections, it can be supplied with three or more.

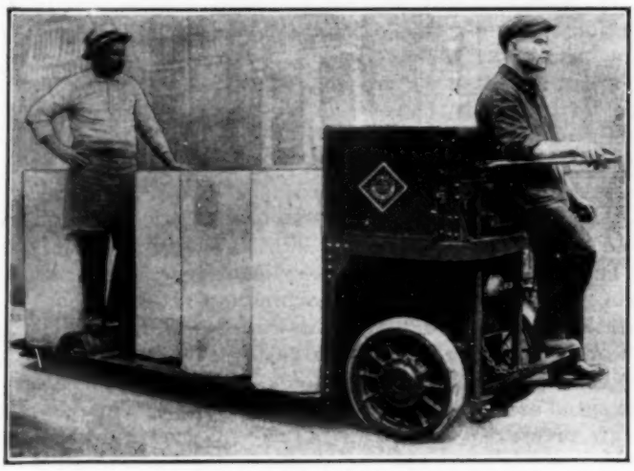
The work may be handled upon wire-bottomed trays or may be left upon the wooden racks upon which work of this nature is often handled in its progress through the factory. The operator has only to push a tray or rack of work into the receiving end of the machine past the swinging flap that confines the steam and spray within the chamber and he need pay no further attention to it or to the machine until it is delivered to the work tables at the other end. Roller tables or conveying tables can be employed for carrying the work both to and from the machine.

For handling large quantities of very small parts, a small tumbling barrel is provided. The ends of the barrel are perforated disks of metal notched on the periphery to match the links of the conveyor. The weight of the barrel and contained work is borne upon trunnions at each end that run upon fixed tracks extending through the chamber. A pinion upon one of the trunnions meshes with a rack attached to the inner wall of the chamber, so that when the barrel is rolled into the receiving end of the machine, though the action of the conveyor links tends to roll it in a reverse direction, the pinion carries it along in the same direction that the conveyor is moving. Thus a differential movement is established. The barrel is slowly rotated and also carried slowly forward. The time of its passage is about five times the normal time of the conveyor.

The machine equipped with two sets of sprays requires a floor space of 116 x 44 in., exclusive of the work handling tables, and it is 61 in. high. It is driven by a 2-hp. motor that can be furnished to suit any current. The net weight is 2,700 pounds.

Elwell-Parker Drop-Frame Factory Truck

The Elwell-Parker Electric Co., Cleveland, Ohio, has recently placed on the market the low-platform electric truck illustrated herewith. The truck is intended for



ELWELL-PARKER DROP-FRAME TRUCK

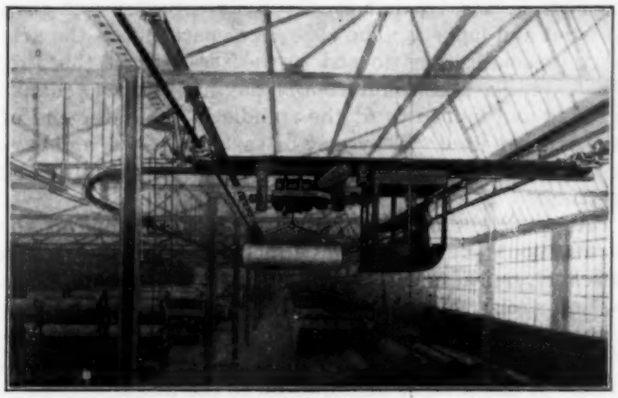
handling barrels, bales and heavy material where an especially low platform is desired. It is very similar to that described on page 347, Vol. 48, of AMERICAN MACHINIST, except with regard to the height of the platform for the load.

The very low platform is obtained by dropping it below the tops of the wheels. Housings are placed over the rear or trailing wheels, which carry rubber tires 10½ in. in diameter and 5 in. wide. The driving wheels have tires 21½ x 3½ in. in size. Steering is accomplished on all four wheels.

The storage battery is carried on the upper deck at the front of the truck. The motor and the worm drive axle are placed below it. The truck is intended to travel from 15 to 20 miles on a single charge of the battery.

Cleveland Hand or Electric Tramrail Crane

A light-weight hoisting and conveying traveling crane with a maximum capacity of two tons, has been added to the hand and electric tramrail equipment manufactured by the tramrail division of the Cleveland Crane and Engineering Co., Wickliffe, Ohio. It is intended



TRANSFER CRANE ON CLEVELAND TRAMRAIL SYSTEM

to act primarily as a feeder or supply crane to the regular tramrail system in the stockroom or other depots, where materials are piled in such a way that an overhead traveling crane can best handle them and convey them over machines, bins and obstructions on the floor.

The light weight of the crane, which runs on the same size rail runways as the tramrail, permits its use in buildings of such structure that a larger traveling crane could not be installed. The runway hangers can be suspended from either the roof trusses or the floor above. The hangers are standardized as to length and method of attachment, a variety of types being furnished to suit the building construction.

The crane consists of an I-beam suspended at each end, as shown in the illustration, from the bottom of two cast-steel carriers, which in turn are suspended in the wheel yoke hangers. The minimum span is 3½ ft., and the maximum 24 feet.

The carrier wheels are fitted with double-row ball bearings. The outer ball bearing races are ground in the chilled wheels, and the inner races on the periphery of the hardened steel hubs. The wheels are arranged in pairs, one on each side of the rail, permitting an easy motion of the crane on the runways. This motion can be operated electrically by cab or floor control, or the beam simply run along the runway by pushing the load that is being conveyed.

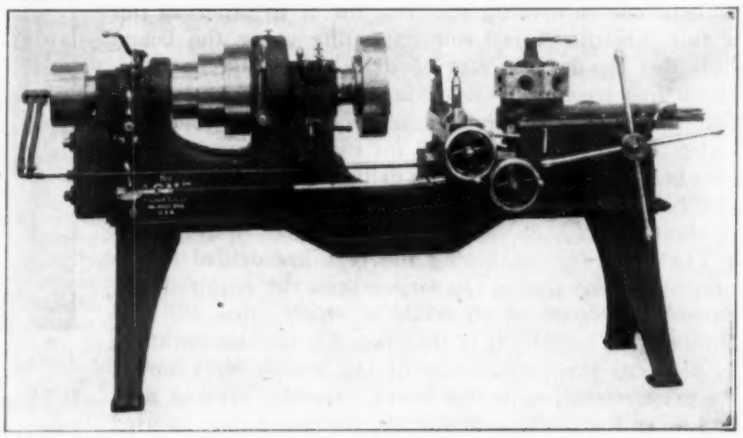
When operated as a simple lightweight crane, there are stop blocks at both ends of the I-beam; when arranged to connect direct with the tramrail system, at one or both ends, the crane becomes a transfer bridge, with stop blocks arranged accordingly. When operating as a transfer bridge, the lower flange of the I-beam matches with the tramrail track at various points along the crane runway, so that the crane may travel over the tramrail system and back again onto the beam. This method of transferring makes it possible to reach all parts of the floor space in the factory. The hoist may climb inclines up to 12½ deg., or run on an elevator to be raised to any floor.

The type of carrier depends on the materials to be handled, the size or length of the system, and the total floor area served. For large installations the most suitable carrier is the electrically operated travel and hoist with an enclosed operator's cab. This equipment permits operating out of doors, and also indoors in foundries and places where fumes or smoke may be encountered. Large indoor installations may be served with an electric carrier having an operator's platform. This arrangement gives speed in travel and permits the operator to hook and unhook the load.

Smaller indoor systems are served from the floor. An electrically operated carrier and hoist may be controlled by a push-button switch on an arm suspended from the carrier to a place within easy reach of the operator. The simplest carrier employed for either the crane or transfer bridge is a hand-operated chain hoist hung on the simple four-wheel carrier, and moved by pushing on the load carried.

Cincinnati Acme Gap Turret Lathe

The accompanying illustration shows a turret lathe provided with a gap bed, a machine that has recently been placed on the market by the Acme Machine Tool Co., Cincinnati, Ohio. It has all the regular dimensions of the 20-in. Cincinnati Acme turret lathe, excepting that the gap provides for a maximum swing over the bed of 28 in. The length of the gap from the end of the spindle is 9½ inches.



CINCINNATI ACME GAP TURRET LATHE

The machine is equipped with an air chuck, power feed for the cross travel of the cut-off rest, and power feed for the longitudinal travel of the turret. However, the arrangement of the feeds can be furnished as desired for the work.

Lawson Drill and Tap Crib and Gage

The Victor R. Lawson Co., 35 Hartford St., Boston, Mass., has recently placed on the market the "One-Glance" drill and tap crib and gage shown in the accompanying illustration. The device consists chiefly of a drill crib with a drill gage built into it. The entire crib is 41 in. long by 9¾ in. wide, and contains sixty semi-circular pockets 1¼ in. wide.

The pockets in the lower row are 4⅛ in. long, and are intended to hold drills from Nos. 1 to 30. The upper pockets are 2⅛ in. long and hold drills from Nos. 31 to 60. The holes for the drill gages are located just at the ends of the pockets in hardened steel strips.

These strips are inserted in the wood of the frame, on which heavy type numerals give the number of the drill required to fit each hole, as well as the drill diameter in decimals. Since the figures are ¼ in. in height, they should be readable at a distance of 8 feet.

LAWSON "ONE-GLANCE" DRILL AND TAP GAGE

The taps are placed perpendicularly in holes in the member dividing the upper and lower pockets. Holes are provided to hold three taps of each size from 14-20 to 4-36. Each set of taps is adjacent to the correct drill to use in drilling the hole for it in order to tap a full thread. A red line extending along the board indicates the largest size of drill that could be used. It is thus possible to select a drill for either ½, ¾ or full thread. It is unnecessary to refer to tables in order to find the proper drill for each case, as the relation between the sizes of the drills and the taps can be observed by noting the relative positions of the tools in the crib.

The holes for containing the taps are drilled to the proper size, so that a tap larger than the required size cannot be placed in it, while a smaller one will fall through the board. It is thus possible for the workman to pick out the correct size of tap merely by knowing its proper position on the board. Besides serving as a container for the taps and drills, the board may be used as a ready reference table of drill sizes.

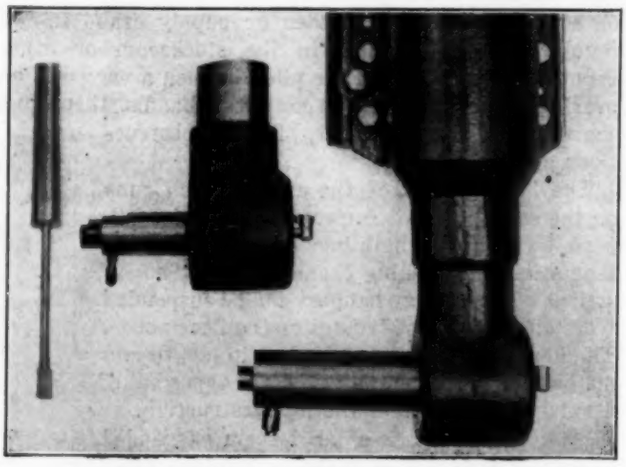
The board holding the pockets is carried on trunnions by two posts mounted on a base, so that the whole unit is easily portable. Due to the fact that the trunnions are tightly pinched in the brackets of the posts, the tray may be titled to any angular position, and will remain so fixed. The base can be attached to the wall, so that it is not even necessary to employ bench space for the crib.

Harris Offset Drilling Attachment

The H. G. Harris Engineering Co., Bridgeport, Conn., has recently developed the offset drilling attachment, shown in the accompanying illustration, for work where a very small clearance space is available. The tool is intended especially for drilling, milling, counter-sinking and counter-boring port holes and grooves in the cylinders of air-driven tools such as drills, hammers and riveters. It is made to reach into the main bore and drill or mill the vents or ports from the inside. It may be used to drill to a specified depth, to counterbore, or to mill circular, transverse or longitudinal slots. It may, of course, be applied to other jobs of drilling in bores, such as when machining oil grooves, keyways or splines.

Owing to the small space and comparatively long overhang with which these tools must work, practically no clearance space is allowed; and the offset or horizontal arm is made as large as the bore of the air chamber and the depth of drilling or milling will permit. Both the power-transmission parts and the offset arm are made of tool steel, heat-treated by the Bellis process, and then ground and lapped. The clearance space inside the arm is very small, so as to add to the strength of the arm. Drills, mills and counterbores having special shanks ground and lapped to fit the spindle in the outer end of the arm are used. They may be easily changed, and have a limited adjustment for depth to allow for grinding and setting.

At the right of the illustration is shown one of the arms mounted in a special bracket on the slide of a Becker vertical milling machine. At the center is shown another offset attachment having a smaller arm and being interchangeable in the bracket with the long arm. The driving spindle is shown at the left of the illustration. It has a taper shank fitted to the machine spindle, and at the lower end is squared to drive the attachment.

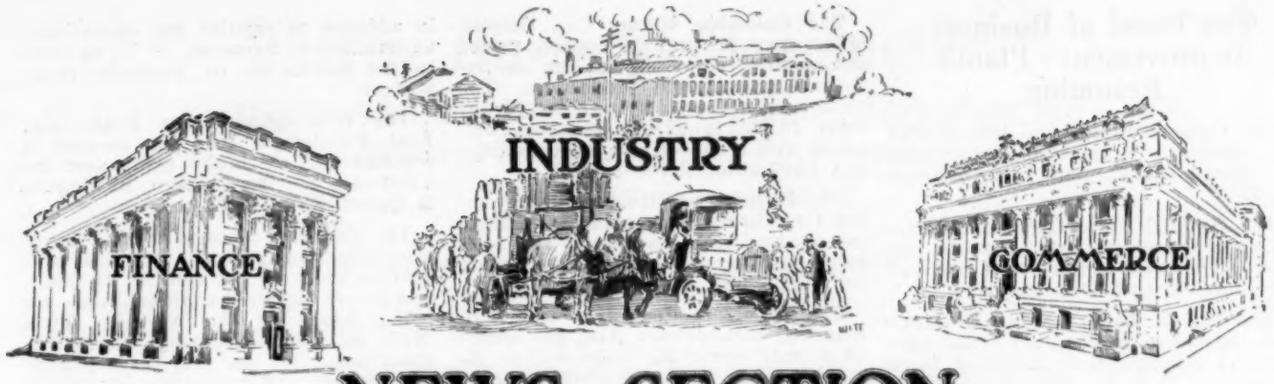


HARRIS OFFSET DRILLING ATTACHMENT

It should be noted that the spindle is necked down between the squared end and the taper shank. This construction increases the elasticity, and also provides a point at which failure will occur in case of jamming of the tools. Since the lower half of the spindle is made of cold-rolled steel sweated into the taper shank, it can be easily replaced.

American Truck Wins

A report to the Department of Commerce states that on Jan. 15 the Argentine army made an official test of trucks for speed and economy when loaded to capacity and operated over dirt roads. The conditions of the test were considered so severe that only four trucks—one American and three German—were entered, although invitations were sent to all truck representatives in Buenos Aires. The course of the run was from Buenos Aires to San Fernando, from there over a dirt road to the national encampment at the Campo de Mayo, and after various tests at the camp, to return to Buenos Aires via Moron. The three German trucks (Krupp, Mercedes and Opel) were forced to abandon the test before reaching Campo de Mayo, but the American truck finished the entire course and completed the trials in a satisfactory manner.



NEWS SECTION

Commerce Department Plans Great Expansion

Many new activities in the Department of Commerce will be made possible after July 1, the beginning of the new fiscal year, as the result of the increase of approximately $370,000 over the amount which was available during the current year.

The greatest expansion will take place in connection with the commodity divisions, fourteen of which have been established since Secretary of Commerce Hoover took office.

Congress granted an increase of $200,000 in this particular fund, the total available for the promotion of export industries during the coming fiscal year being $450,000 as against $250,000 for the current year.

Four new divisions will be established covering the following industries: paints, chemicals, dyes and drugs; foreign investments and finance; advertising, packing and credit methods of exporters; and a specialty division to care for miscellaneous work.

New trade offices will be established in South and Central America and in Hong Kong, Bombay, Delhi and Batavia.

Superintendents' Club

Superintendents of thirty-six plants at Evansville, Ind., in different lines of industry, including machinery, metalworking, etc., have organized a local Factory Superintendent's Club, to meet once a month for a discussion of technical matters and problems, as well as to promote social relations between the men and affiliated interests. The organization proposes to co-operate with the Engineers' Club, recently formed in that city.

Cuba Leads in Purchase of Sugar Machinery

A recent report of the Bureau of Foreign and Domestic Commerce of the Department of Commerce states that $145,099 worth of sugar mill machinery was exported from the United States during January of this year. The figures show that Cuba was the largest customer, taking nearly one-third of the entire amount. Peru was also a healthy buyer, taking about $28,000 worth, while Mexico, Argentina and a few other South American countries also bought heavily.

Government Aid for Standardization of Implements

Senator France, of Maryland, believes there is need for standardization of farm machinery, and has introduced an amendment to the Agricultural Appropriation Bill, appropriating $10,000 for studies to that end by the Department of Agriculture. The amendment calls on that department to study the problem of the standardization and simplification of farm implements and machinery, and of repair parts for the same, with a view to more economical manufacture and use of the same.

Senator McNary to Report Against Metric Bill

A short, vigorous report condemning any compulsory adoption of the metric system will be made in the near future by Senator McNary, chairman of the sub-committee which has just completed an extended hearing on the Britton-Ladd metric system bill. This report will be made to the full committee, which is expected to adopt it as its own. Advocates of the metric system have asked Senator McNary if he would be willing to recommend the exclusive use, after five years, of the metric system by the Government.

Exports of Agricultural Implements Increase

Exports of agricultural implements and tractors for the first month of 1922 show an increase of $314,208 over the month of December, 1921, according to a report by the agricultural implement division of the Department of Commerce. Compared with January, 1921, however, there is a very decided drop—from $7,320,277 in that month to $1,011,435 in January of this year. There is reason for encouragement in the fact that statistics for January indicate an upward trend of exports. The exports for January, 1921, were not equaled during any other month of that year and steadily declined in succeeding months, reaching their lowest mark in the last month of the year, when the exports of implements were valued at $697,227.

The chief decrease in January, 1922, as compared with January, 1921, was in plows, cultivators, mowers and reapers.

Belgians Beat Germans for Rail Contract

That German costs are rising is indicated by the bid on 650 freight cars recently opened by the Argentine government railways. Germany has specialized in rolling stock construction and is recognized as being particularly strong in that field, yet she submitted a price more than double that of the lowest bidder.

This particular order, according to advices to the Department of Commerce, went to Belgium. The Belgian manufacturers agreed to furnish the 650 freight cars for 1,080,000 gold pesos. The American bid was 1,160,000 pesos. The British bid was 2,000,000 pesos, and that of the Germans 2,480,000 pesos.

Perpetual Inventory Study by Chamber of Commerce

The perpetual inventory, or stores control system, is strongly urged by the fabricated production department of the Chamber of Commerce of the United States as a better method in manufacturing establishments than the annual physical inventory, with its general disorganization and shutting down of the plant.

A practical treatise on the subject, which has just been issued by the Department under the title of "Perpetual Inventory or Stores Control," goes at length into the advantages of perpetual inventory and carries a series of illustrative forms. Doing away with the annual inventory of materials is only one of a number of benefits derived from the system as set forth by the department. Copies of the pamphlet may be had in limited quantities, free of charge, from the Chamber of Commerce of the United States, Mills Bldg., Washington, D. C.

Army Acquires More Ordnance Property

President Harding has approved an act of Congress authorizing the acquisition by the Army of a number of ordnance depots, including tracts of real estate for army purposes and including the following for ordnance depots: Ordnance depot, Savanna, Ill.; ordnance depot Pedricktown, N. J.; ordnance storage depot Middletown, Pa.; Aberdeen Proving Ground, Md.

The Trend of Business Improvement—Plants Resuming

The Chicago Bridge and Iron Works has increased the operating schedule at its Greenville, Pa., plant to 50 hours a week.

The Oakland Motor Car Co., Pontiac, Mich., is increasing operations at its plant and is now running on a basis of 100 complete automobiles a day.

The Ingalls Iron Works, Birmingham, Ala., has inaugurated a full-time working schedule with increased force of men.

The Missouri-Pacific Railroad Co. has resumed operations at its shops at Kansas City, Mo., following a shut down since last November. Other car and locomotive shops of the company at St. Louis, Sedalia, Mo., Littlerock, Mo., and Desoto, Mo., are now in operation, giving employment to a total of over 1,100 men.

The American Steel and Wire Co. has adopted a capacity schedule at its plant at Salem, Ohio.

The Stewart Manufacturing Co., 4535 Fullerton Ave., Chicago, Ill., manufacturer of die castings, is increasing production at its plant. The company is a subsidiary of the Stewart-Warner Speedometer Corporation, which organization is also operating at greater capacity at its plant on Diversey Parkway, Chicago. The company has booked business during the last three months of close to 100 per cent in excess of the corresponding period of a year ago.

The St. Louis Car Co., North Broadway, St. Louis, Mo., has received an order from the Southern Pacific Railroad Co., for 50 steel electric passenger cars for use on the lines of the Pacific Electric Railway, Los Angeles, Cal.

The American Locomotive Co., New York, N. Y., has taken orders for seventeen locomotives, including seven 102-ton Pacific type and three 76-ton switching engines for the Florida-East Coast Railway Co.; one 138-ton Mikado-type locomotive for the Kentucky & Tennessee Railroad Co.; four switching engines for industrial companies; and two switching engines for export account.

The Wood Newspaper Machinery Corporation, Plainfield, N. J., has adopted a full week operating schedule of 48 hours at its plant, replacing a 5-day week running basis.

The Wilson Foundry and Machine Co., Pontiac, Mich., is operating at full capacity its tire mold department, and has secured an order from the Fisk Rubber Co., Chicopee Falls, Mass., that will insure a continuance of production on this basis throughout the spring and summer. The company is operating its Knight motor department on a basis of fifty automobile engines per day. The Wilson company is a subsidiary of the Willys-Overland Co., Toledo, Ohio.

The St. Louis-San Francisco Railroad Co. will increase the working force at its locomotive shops in Springfield, Mo., and will soon commence the installation of new machine tools and operating equipment to cost about $200,000.

The Columbia Motors Co., Detroit, Mich., manufacturer of popular priced automobiles, is arranging for an immediate increase in production. The 1922 schedule calls for an output of from 10,000 to 12,000 cars, as compared with a capacity of 2,000 in 1921, and 4,500 automobiles in 1920.

The Birmingham Machine and Foundry Co., Birmingham, Ala., is increasing production at its plant. The company has secured a number of orders for sugar mill machinery.

The Tennessee Coal, Iron and Railroad Co., Birmingham, Ala., has adopted a full operating capacity at its structural car works at Fairfield, near Birmingham. The tie plate department of the company is also running full.

The Bridgeport Rolling Mills, Inc., has increased production to 90 per cent of full capacity. The plant is working on a basis of 55 hours a week.

The Slatington Iron and Steel Co., Slatington, Pa., has resumed operations at its rolling mill.

The Packard Motor Car Co., Detroit, Mich., has advanced production to sixty-five automobiles per day, including passenger cars and motor trucks. Employment is being given to 4,000 men, as compared with a force of 2,670 operatives at this same time last year.

The Bethlehem Shipbuilding Co., Ltd., a subsidiary of the Bethlehem Steel Co., has taken a contract for the construction of three railroad car floats for the Lehigh Valley Railroad Co., and will handle the work at its Sparrows Point, Md., plant. The floats will cost $256,000.

The Moon Motor Car Co., St. Louis, Mo., is increasing operations at its plant and has adopted a manufacturing schedule 25 per cent in excess of the corresponding period last year. Sufficient orders have been secured to insure capacity output until well into July.

The New York Central Railroad Co. has resumed operations at its shops at Ashtabula, Ohio, following a shut down for several months.

The Pere Marquette Railroad Co. has leased its shops at Saginaw, Mich., to the Kellogg-Crego Co., Chicago, Ill., which has resumed operations at the plant for contract work for the road.

The Romer Axe Co., Dunkirk, N. Y., has opened its plant with a full working force, following a curtailment for several months past. It is said that sufficient orders are on hand to insure regular production for the remainder of the year.

The Georgia Central Railroad Co., Atlanta, Ga., will soon place orders for 500 steel underframe ventilator box cars to cost about $825,000.

The American Locomotive Co. has taken a contract for repair work for the Lehigh Valley Railroad, and will handle the order at its Brooks plant, Dunkirk, N. Y., giving employment to about 1,500 men in this department.

The Atlas Tack Co., Fairhaven, Mass., has increased production at its plant. During this same period last year the company was running at about 65 per cent.

The Remington Typewriter Co., New York, N. Y., has adopted a night shift, in addition to regular day operations, at its plant at Syracuse, N. Y., devoted to the production of portable typewriters.

The Westinghouse Air Brake Co., East Pittsburgh, Pa., has secured a contract for air brake equipment for 7,300 cars for the Chicago, Burlington & Quincy Railroad Co.

The Chandler Motor Car Co., Cleveland, Ohio, has recently increased production about 50 per cent at its plant, and several hundred additional men are being added to the working force. With manufacture during March, the plant ouput for the first three months of this year will exceed the production for the last eight months of 1921.

William McLaughlin, Newark, N. J., operating a machine shop and metal stamping works, is arranging for increase in production and will remove his plant to the ground floor of the building at 2 Johnson Ave.

The H. & G. Die Head Works, subsidiary of the Eastern Machine Screw Corporation, New Haven, Conn., is working ten hours a day, five days a week. The company reports increased business in January and February.

The blast furnace of the Carnegie Steel Co., located at Isabella, Pa., and employing about 200 men, will be blown in this week. It has been closed down since last May.

The Berwick, Pa., plant of the American Car and Foundry Co. has received an order for thirty steel railway coaches.

The Barney & Berry skate works in Springfield, Mass., owned by the Winchester Repeating Arms Co., is to double its plant force within the next few weeks, bringing its production of ice skates for next season's trade to 2,000 pairs daily. For the past three months the concern has been making roller skates chiefly, for which it reports a good market demand.

The Graton & Knight Co., Worcester, Mass., is operating on a 50-hour week schedule with 900 employees. The company makes leather belting and leather specialties.

The American Car and Foundry Co. has taken a contract from the Central Railroad of New Jersey for thirty all-steel passenger cars. The work will be done at the Berwick, Pa., shops.

The Cleveland, Cincinnati, Chicago & St. Louis Railroad Co. has resumed operations in the freight car department at its shops at Beach Grove, near Indianapolis, Ind. The locomotive department will be reopened at an early date, either on a piece work basis, or under a contract plan.

The Hupp Motor Corporation, Detroit, Mich., is operating under an increased production schedule, with shipments during the past month totaling more than four times those of the corresponding period for last year. The company has adopted a production basis of 30,000 cars during the present year.

The Bridgeport Castings Co., 200 North Ave., Bridgeport, Conn., has recently received orders which will keep the plant in operation for some time to come. Additional men have recently been put on, and the shops are working to full capacity.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

(Copyrighted, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York)

Not long ago I asked the head of one of the largest merchandising houses in New York City what he thought of the outlook, and he answered that if the lawmakers at Washington would only let business alone to work out its own salvation, the future appeared as bright as he could wish. The particular legislative monstrosities which he assailed were the soldiers' bonus and the tariff. His remark has often recurred to me, as in analyzing the phenomena which stimulate or depress business because they inspire or impair confidence, I have seen how frequently of late the favorable items in a week's news come from the business columns and the unfavorable items from the political dispatches. The passage of the bonus bill by the House is a case in point, though it is a mere political gesture and is not likely to be enacted into law.

I gave first place this week to the figures of our foreign trade for February, read in light of the knowledge that the Senate Finance Committee is working out the details of a tariff which will make permanent, and in some cases increase, the high duties already in force, although the steady shrinkage in our export trade is sufficient evidence that we cannot sell abroad if we make it impossible for our foreign customers to sell to us. Last month the excess of exports over imports left a balance in our favor of only $34,000,000. This campares with a balance of $235,000,000 in February 1921, and although February is a short month it is construed by many to indicate a very serious reduction in the export demand for our products and a favorable trade balance of not more than $600,000,000 for the present calendar year.

Second place is given to the falling off in income taxes. It is evident that the extent of the decrease from last year is greater than had been supposed. The best guesses now put it at a minimum of 40 per cent, and Perley Morse, the well-known accountant, suggests that it may reach 61 per cent, basing his estimate on a large number of returns showing an average decrease of 36 per cent in individual incomes and 88 per cent in those of corporations.

INCOME TAX SHORTAGE

Government reports show that March 15 payments, totaling $400,000,000, were $328,000,000 less than the collections of March 15, 1921, and $60,000,000 below the official estimates. The result will be a shortage of over $100,000,000 in revenues estimated in the budget for the year ending June 30, 1922, and an equal shortage in the next fiscal year, when an expenditure of $3,505,000,000 is contemplated. It is plain, therefore, that the Government will soon be face to face with a deficit that can only be met by additional taxation unless Congress has the courage to cut appropriations below any figure yet considered.

It is well for those who are disposed to be overconfident to remember that a prospect which includes increased taxation and a decreased export trade cannot be especially encouraging. Considering also the unsettled textile strike and the threatened coal strike it is not surprising that a slight reactionary tendency was generally noticeable last week. That the tendency was no more marked is itself striking evidence of the stolid confidence with which the future is now generally regarded in the United States. The neurasthenia that was so common a while back has entirely disappeared and pessimism has given way to a hopeful expectancy of good times this summer.

MONEY MARKET EASIER

There is plenty of credit, at least in the larger cities. The demand for new bond issues is larger than the supply. The money market is easy at the rates quoted last week. Liberty Bonds have advanced to a new high record. Corporate bonds are firm and higher and the stock market has been strong enough to absorb heavy realizing sales without more than a nominal decline. The Federal Reserve ratio recovered promptly from the decline incident to withdrawals for tax payments, and is back at 78.4 per cent, a new high record since we entered the war in April, 1917.

Industrial improvement is probably most noticeable in the steel trade, which reports a substantial increase in both orders and production at higher prices. Concurrently there is a remarkable gain in building activity, important not only because it means increased employment but because each residence constructed means a greater demand for furnishings and other goods in which people will no longer be disposed to economize when they live in their own homes.

Railroad traffic is larger, though the increase is chiefly in coal that is being accumulated against the threatened strike. The decision of the Interstate Commerce Commission on freight rates will be rendered within a few days, and the Bureau of Railway Economics points out that reductions already voluntarily put into effect have saved consumers $300,000,000, though not long ago railroad presidents were assuring us that rate reductions, if forced upon them, would save the public practically nothing. The rumor of negotiations for a consolidation of the Delaware, Lackawanna & Western, Nickel Plate, Clover Leaf and Pere Marquette lines is a shadow of coming combinations which will in time strengthen the weaker roads and change the railway map of the country beyond recognition.

In the cotton goods trade the demand is still below normal as buyers expect heavier offerings when the New England strike is ended, and raw cotton has also yielded appreciably although an increased demand is to be expected when the mills resume operations.

According to the final ginning returns, which put this year's crop at 7,962,530 five-hundred-pound bales, the Agricultural Department has succeeded in substantially underestimating and overestimating the crop in the same season. This is an unusual achievement that will somewhat impair confidence in the future estimates of that high authority, and next year's crop will be as large or as small as public opinion makes it until the facts are known late in the season, when they will have lost their influence as a market factor.

Among the industries increased activity in machinery and tools is notable. The Department of Commerce reports that business is gradually working its way back to normal, the Bureau of Labor Statistics reports that unemployment is decreasing, and the treasury Department that higher prices are to be expected, a prediction made in these articles when the influx of gold first reached a volume which made it an important economic influence.

STRIKE WILL COME

Factories are well fortified with supplies for the coal strike. It is hard to believe it will occur, but the present indications are that the peace makers will fail. The Geological Survey reports show that the industry provides its workers with an average of only three days work a week and if the strike takes place the result will probably be a dispersion of the surplus labor.

In Europe conditions are much the same as here. It is easy money against the partial paralysis of commerce caused by political uncertainty and high taxes. The result is a booming market for investment securities and a slow improvement of trade as the optimism engendered on the Stock Exchange gradually extends itself among manufacturers and merchants. The Genoa conference, the German reparations and the almost forgotten war in which Greece and Turkey are engaged are all duly discussed in the newspapers, but the commercial mind seems to have been indurated by its experience prior to the armistice and is apparently willing to believe that men must go on buying and selling, whether they are fighting or not.

This is a philosophy of fatalism which is highly dangerous and is certain to lead to trouble because it creates a lethargic sense of the security that can only be secured by constant vigilance. There is every reason why America should be prosperous and will be prosperous, if the burden of taxation is equitably distributed and the commercial enterprise of the nation is unhampered by a tariff so high that it excludes us from the world's markets as sellers as well as buyers. Upon the determination of business men in impressing these truths upon those who make our laws the economic future is dependent.

Business Conditions in Germany

By OUR BERLIN CORRESPONDENT

The mark is, after a short interval of comparative stability, again on the downslide. This happened while the economic factors which should determine the value of the money are pointing in the opposite direction. With some great effort, the budget of the current year has been made to balance, at least on paper. The state railroads show better results, due to the increased rates which do not seem to have materially affected the passenger traffic, while the goods traffic has become even larger. The foreign trade of the country is again showing a balance on the export side due to reduced imports and increased exports. In January the exports exceeded imports by nearly 1,800 million paper marks. Reports from the seaports, especially Hamburg, indicate that the overseas traffic of the country is running close up to the pre-war level, having reached nearly 85 per cent of that of the years immediately preceding the war. Progress and enterprise are visible in all lines of business, new markets are being opened, especially in the East.

Government Deceit

All these items would indicate strong progress towards recovery, and should in all reasonable expectation react upon the valuation of the mark, especially as nothing untoward has happened to the foreign situation of the country, which from all signs has even been somewhat eased. There can be no doubt that the recent downslide of the mark is of Germany's own making and comes from inside. It marks the abandonment of all hope of an early adjustment of the reparations problem. This hope, which found its strongest support in the rumored promises coming from England of an impending reduction of the indemnity, has been deliberately and skilfully fostered by the government through the press, for purposes of its own.

The optimism thus created has exceeded all bounds, and led the population to the belief that a fair readjustment was on the way. Germany's financial stress is now recognized as being responsible for the business slump of the whole world. So deep rooted was this belief that all faces were turned to the forthcoming conference of Genoa, with hopes that could not have been brighter. The disappointment felt now, when it becomes clearer that the conference of Genoa will probably be an affair which, since the historical Tower of Babel, has not had its equal, is keen and strong reaction is bound to follow. Most manufacturers have held back with procuring cover for their foreign purchases until the futility of all hopes of an improvement of the exchange became apparent to all eyes.

In what state the mark will appear before the conference at Genoa is an open question, but nobody seems to care. In the mentality of the circles akin to manufacturing interests it cannot be low enough. Appearances are kept up, no doubt in good faith, but secretly the sails are set for steering full speed into a crisis. Nothing short of a severe crisis, showing Germany on the verge of bankruptcy, is estimated in those circles as the only means for creating in the world a frame of mind conducive to a radical improvement.

Under such circumstances it is not surprising that the collapse of the hopes centering in the Genoa conference is immediately followed by a wave of rising prices. Judging from the initial indications, this upward movement will take record dimensions. There is much talk at present of prices running up to gold standards, but such talk is no doubt strongly exaggerated and misleading. The economic forces, which probably are not strong enough to control the movement of prices but surely to retard it, will do all in their power to maintain the margin between the purchasing power of the mark inside and outside of the country. There can be no doubt that the present move will take a halt only after all previous levels have been passed.

The prime mover is the price of coal, which is quickly approaching 1,000 marks per ton under the combined influence of the basic prices and the increased coal tax. From the coal prices a parallel movement is imparted to prices of all other commodities and to wages. In fact, it is being seriously considered to adopt the movement of the coal prices as a factor governing wages, not only for the miners but in general. Under the first impact of the price wave the question of sliding wages is again most vigorously put forward by the trade unions. It will be remembered that up to now agreements have been formed between the workmens' unions and the employers' associations settling wages for a specific period. These agreements were a great help to manufacturers, providing a truce between workmen and employers during a certain time and furnishing a basis for the calculation of manufacturing costs. They are now attacked for constituting a hardship to the workmen during times of strong price fluctuations. By way of a compromise it is being proposed that while the term for which the agreements are concluded will not be reduced, an arbitration will be instituted, which during certain intervals is to adjust the wages according to the index figures for the cost of living. There is no manifest unrest among the workmen, but it is admitted that some concessions will have to be made to the workmen to keep discontent down at its normal size.

Preparing for Worst

It can be seen that the business world of the country is putting its house in order, preparing for an aggravation of the present financial conditions. Every part of the economic machinery is striving for an improvement of its own particular interests, and there can be no doubt that lively times are ahead. Manufacturers and the trade are gradually inaugurating a small battle between themselves. The chief bone of contention is the export control. While this is, of course, instituted by the government, the executors are the manufacturing associations, which have been able to arrange matters in such a way that in foreign business transacted through the medium of the trade, manufacturers get the profits and dealers get none.

The total exports in January was 2,027,000 tons (compared with 1,929,519 tons in December, 1921), valued at 14,527 million paper marks. It is interesting to note that while the volume of exports has increased by over 100,000 tons since December, the value remained stationary. The export prices have therefore decreased, evidently due to the rise of the mark in December. The gross average per ton was something over 7,000 paper marks or 35 gold marks, whereas the pre-war average was 154 gold marks per ton, or more than four times higher. The composition of the exports differs largely from that of pre-war times, a strong shifting between goods of high and low value having taken place. This explains the low average of export prices to some extent, but not entirely, as in no class of goods are the export prices up to pre-war standards. An increase of the exports since December has taken place in steel and iron products, and chemical and mineral produce, while against all expectations the exports of the machine building and electrical industries have dropped. The prices of the latter have slightly improved, but the advance is immaterial.

The Russian Market

Russia as a future market is becoming more and more prominent, at least in public and private discussion. Emissaries of the German government, as well as private manufacturing combines are traveling over Russia, taking up pre-war relations or establishing new ones. The number of Russians coming to Germany is swelling day by day. There are over 100,000 living in Berlin alone. There can be no doubt that this influx of the Russian element is secretly favored by the authorities. The Soviet government has now established a business-like organization for trade with Germany. A novel form has been chosen for making this organization workable and effective, consisting of a combination between private and governmental interests. A company has been formed in which a private firm and the Russian government are partners, for the trading of metals from Russia to Germany and metal products into Russia. The basic principle of all this business is the "swapping" of goods. The actual business transacted is still of modest dimensions. The Russians offer payment in kind, and business of this kind needs much preparation before it comes into full swing. The expectations, however, that the German business world would find it very easy to deal with Russia, were doomed to disappointment. The trade emissaries that Russia sent are very shrewd business men, not the ignorant, easy-going sort that was expected. They have discovered flaws in several large contracts concluded some time ago, and are now trying hard to get out of them. The methods so far employed toward Russia have greatly impaired the progress of business relations, and before business will grow to any considerable dimensions, it will be necessary for the Germans to revise their estimate of the Russians' commercial abilities.

The much talked about contracts for railroad material for Russia, reduced

to actual size, are approximately 100 million dollars, of which nearly one-half fell to Germany, while a little less went to Sweden. Small orders were placed in England, Austria, Denmark, Canada and Czecho Slovakia. The orders to Germany comprise 700 locomotives at 84 million gold roubles; 1,000 tank cars, 77,500 tons of rails, 18,569 tons of steel tires; machine tools, steel, wiring and metal. The orders contracted with Sweden consisted of 1,000 locomotives, 200 locomotive boilers and 500 tank cars.

Rumors have lately again been afloat of foreign investments in German business enterprises, coming especially from Upper Silesia. While it seems a fact that French and English capitalists are fighting for the control of several of the most important upper Silesian works, no actual transactions have so far been completed. Such rumors, therefore, have to be treated with great reserve, as they originate mostly from vivid phantasy, and if they are based on facts are mostly premature and exaggerated. It has been freely stated that the Guggenheim concern has again bought up large blocks of shares of the A. E. G. (General Electric Co.), and that the stock of this company will shortly be traded on Wall Street. If this really happened, it would not cause anger in the country, but rather envy. On the other hand, it is being whispered that American firms are about to start manufacturing in Germany. Reports have been heard about the Yale & Towne Co., and about Ford, who is said to be negotiating at present for a manufacturing site in Hamburg.

Unemployment has risen from 1.6 to 3.3 per cent. The number of unemployed was 190,000 at the end of January, of which 165,000 received government subsidies. Unemployment in the machine building industry has risen from 0.5 per cent in December, to 0.7 per cent now. Compared with 163 in December, there were 329 applications of machinists for every 100 jobs.

Machine Tools Show Profits

The machine tool companies are now issuing their reports for the past year. At least the first half of that year was filled with complaints of bad and insufficient business, but this finds no expression in the final results. These results are without exception excellent, and constitute for many firms a record of prosperity. The dividends paid are in most cases keeping only the level of the best preceding business years, but this is due rather to the policy of the management not to create undue attention by sensational figures, than to the size of profits. In most cases it can be noticed that large parts of the profits have been set aside for writing off before drawing up the balance. Besides such "hidden" reserves, there are large open reserves on the balance sheets, for renewal of equipment, workmen's welfare funds, and the like. The Pittler Co., for instance, paid a 30 per cent dividend, but its net profits are higher than the share capital. The Magdeburger Machine Tool Co., manufacturer of high-speed lathes and turret lathes, which had a profit of one million marks in 1920, netted four million marks last year. The gross profits, however, exceeded the capital. The turnover of most companies has more than trebled. A 25 per cent dividend is the average return of the machine tool business.

Screw Thread Commission Lays Plans for Future

Sheet metal and wire gage numbers; tap-drill sizes; bolt, nut and rivet proportions; bolt-head, nut and screw-head standardization; standardization of instrument threads and those cut on brass-tubing; standardization of acme, square, and other special threads, and a study of tolerances and stock sizes for cut and rolled threads, are some of the matters which will occupy the attention of the National Screw Thread Commission during its term which has just been extended until March 21, 1927. In addition it will continue the study of its tentative report on screw threads with the view to certain rearrangements and the insertion of suitable notes with reference to the application of various classes of fit.

A tentative discussion of the work which is to occupy the commission during the next five years was held at a meeting held in Washington on March 17. Eight of the nine members of the commission were in attendance. Dr. S. W. Stratton presided and led the discussion.

A report on tap-drill sizes was submitted to the commission by the sub-committee which has been studying that problem. After some discussion of the report it was decided to recommit the report to the sub-committee so as to embody certain changes agreed upon during the discussion. As soon as the sub-committee completes the tap-size report, it will be submitted to the industries concerned for comment and criticism before the commission takes any final action toward making it a national standard.

In connection with the study being made of sheet metal and wire sizes, Col. E. C. Peck submitted a decimal system in accordance with the proposal made by the American Society of Mechanical Engineers in 1895. At that time the mechanical engineers recommended the discarding of all gage numbers with the idea that wire and sheet metal could be described better by decimal parts of an inch—the number of thousandths of an inch indicating the gage number as well as the exact size.

Arrangements have been made for co-operation between the National Screw Thread Commission and the sectional committee of the American Engineering Standards Committee which is studying bolt, nut and rivet proportions. The sub-committee which will work with the American Engineering Standards sectional committee on the matters pertaining to bolts, nuts, rivets and screw-heads, is composed of F. O. Wells, E. H. Ehrman, and Commander J. N. Ferguson. A sub-committee consisting of Dr. Stratton, Commander Ferugson and Mr. Wells will make a tentative study of the standardization of instrument threads and brass tubing threads. Another sub-committee composed of Major J. O. Johnson, R. E. Flanders, Lieut.-Commander C. A. Jones, and Earl Buckingham will take up a study on acme, square and other special threads. These sub-committees will do some preliminary work on the problems assigned to them and will present some of their conclusions at another meeting of the full commission which will take place the latter part of April.

Washington Notes

By Paul Wooton

Increased purchases of industrial machinery will be made in Asia and Latin-America, it is indicated by reports reaching the Department of Commerce from widely separated sources throughout the Far East and from various industrial centers in the Spanish-speaking republics. It is pointed out that American business men are too prone to center their attention on the European exchanges. That Asia is recovering its buying power is indicated clearly in a number of ways, while its exchange rates are approaching 1913 levels. While recovery in Latin-America is not proceeding so rapidly, the situation is very greatly improved with the prospects favoring its acceleration.

Development in the Far East is proceeding much more rapidly than is generally realized. In the last three years, the United States has sold Asia more than $200,000,000 of industrial machinery. This exceeds the total sales of industrial machinery during the fifty-year period between 1863 and 1913. An idea of the expans. n of commerce generally in the Far East may be obtained from the fact that the commerce of the island of Formosa alone in 1920 was greater than that of all Japan in 1904. Comparable expansion is taking place in the commerce of the Philippines, of China, and of British India. The social evolution which is progressing so rapidly in Asia carries with it much higher standards of living, from which results a great demand for goods.

Some fear has been expressed that the reduction in naval construction in Japan would interfere with the demand for metal working machinery. In the opinion of W. H. Rastall, chief of the heavy machinery division of the Department of Commerce, such reduction of orders as may result from that cause is entirely insignificant when compared with the general industrial expansion which is certain to take place in the Far East. He also points out that while our exports of machinery are low at present, this applies to the German and British exports as well. The German exports particularly are running much below the volume of 1912 and of 1913. The British in 1913 exported 103,592 tons of heavy machinery. In 1920 their exports were 89,794 tons and in 1921, 55,012 tons.

Grover C. Loening Heads Aeronautical Chamber

The board of governors of the Aeronautical Chamber of Commerce of America, Inc., at a meeting at the executive offices in New York City on March 15, elected the following officers: President, Grover C. Loening; first vice-president, Charles F. Redden; second vice-president, C. C. Witmer; treasurer, B. E. Bushnell; secretary and general manager, S. S. Bradley, Manufacturers Aircraft Association, Inc.

The Maryland Legislature has petitioned Congress asking that the Indian Head, Md., Proving Ground be re-established, and that ordnance machinery and equipment be returned thereto from Dahlgren, Va.

Chicago Letter

After summarizing the reports of the machine tool dealers in the Chicago district, it might be said that there is just enough activity in the machine tool market to keep the outlook optimistic. The demand for tools and equipment is slowly but surely growing more pronounced. Inquiries continue to come from miscellaneous and widely scattered sources.

The Western Clock Co., LaSalle, Ill., which was reported last week as having purchased twenty-four automatic screw machines, has made additional purchases in the form of two geared-head motor-driven engine lathes, one geared-head motor-driven 26-in. shaper and three bench lathes with side heads.

The local railroads are doing practically no buying against their outstanding lists. The Santa Fe System has not made any further inquiries this week but it is expected it will issue a list shortly for a proposed boiler shop at Albuquerque, N. M. Regarding the Burlington list which has been expected for some time, it is now thought that because of the recent fire which did considerable damage to the office building and destroyed many valuable records, the list will be further delayed. It is understood that the Illinois Central is working on a three-year machine tool program and for some time past it has been expected to issue a list for the requirements of the first year. The Great Northern R.R., St. Paul, Minn., has issued a list calling for bids on twelve machines.

Although the railroads are slow in purchasing machine tools they seem to be very optimistic in other lines. The Chicago, Burlington & Quincy is receiving bids for the superstructure of a freight house to cost $3,000,000 at Canal, Harrison and Polk Sts., Chicago. Recently this road completed the construction of one of the largest sheep yards in the United States, at Montgomery, Ill. The yards include seven barns, 1,000 acres of pasture, an elevator with a capacity of 100,000 bushels, and various other buildings.

The Chicago Great Western R.R. recently awarded a contract to the Roberts & Schaefer Co., engineers and contractors, Chicago, for the erection of a fireproof automatic two-track, 100-ton capacity coaling and sanding plant for installation at its Forty-sixth Ave. yard, in Chicago. The plant will be equipped with Strait scales for recording all issues of coal taken by engines. The Chicago, Rock Island & Pacific Ry. is planning to build a locomotive shop at Little Rock, Ark., to cost $225,000. C. A. Morse, Chicago, Ill., is chief engineer.

The Chicago & Northwestern recently inquired for 2,700 freight cars, 1,250 forty-ton box cars, 500 forty-ton stock cars, 254 forty-ton refrigerator cars, 250 fifty-ton gondola cars, and 500 fifty-ton flat cars. The Chicago, Burlington & Quincy placed an order with the Illinois Steel Co. for 8,000 kegs of spikes and recently closed bids on 81,200 tie-plates.

The radio craze which has taken a good hold all over the country has gripped Chicago and the demand for sets is so great that it has resulted in numerous firms being formed to manufacture sets and supplies.

About $45,000 worth of equipment and property was recently damaged by a fire in the plant of the Elaborated Roofing Co., Forty-Fourth and LaSalle Sts., Chicago.

Alfred S. Alshuller, architect, 28 E. Jackson Blvd., awarded a contract for the construction of a three-story automobile salesroom and service station, 100 x 390 ft., on Michigan Ave. and Twenty-third St. for the Hudson Motor Car Co.

Cervine & Horn, architects, 310 Safety Building, Rock Island, Ill., have plans under way for the Illinois Oil Co., of that city, for a new three-story plant, 40 x 150 ft. It is estimated that the project will cost about $165,000, including equipment.

The Vienna Model Bakery Co., 1040 Vernon Park Ave., finally awarded the contract for the construction of its new bakery at Congress and Racine Avenue, to the Krahl Construction Company, 350 N. Clark St.; cost $150,000.

M. Alter, 2656 Potomac Ave., was awarded a contract for the construction of a two-story garage, 72 x 107 ft., at Taylor and Garibaldi Aves.; cost $50,000.

The Boyle Ice Co., 847 Larrabee St., awarded contract to A. C. Thielberg, 154 W. Randolph St., for the construction of a two-story ice-manufacturing-plant to cost $40,000.

Franklin to Build New Car at Syracuse

After many conflicting rumors had gone the rounds in the automotive field, plans were finally announced last week by H. H. Franklin, president of the Franklin Automobile Company, for the building of the new model "Franklin Four." The plant will be located in Syracuse, N. Y., and production of one hundred four-cylinder cars a day will start about April 1, 1923. This new model will sell in the $1,000 class. Running at full time the proposed plant will employ about five thousand men and the payroll will aggregate $10,000,000 annually.

Machinery Dealers at Birmingham Next Month

Plans for the twenty-first annual convention of the Southern Supply and Machinery Dealers' Association are rapidly maturing. Headquarters have been established at the Tutwiler Hotel, Birmingham, Ala., where all the sessions will be held. Three days, April 24, 25 and 26, have been set for the convention. J. H. McKinnon, president of the association will preside and he will be assisted by N. A. Gladding, president of the American Supply and Machinery Manufacturers' Association, which will hold joint conventions with the Southern association during the three days.

The speakers have not all been assigned, but those accepted are as follows: W. H. Kettig, of the Sixth Federal Reserve District, on banking and its relation to business; C. H. Houston, of the Department of Commerce, on that department's activities; Robert S. Carter, Whitman-Barnes Co., on the twist drill situation; J. H. McKinnon on standardization of stocks; and L. Z. Larzelere on handling credits.

Cleveland Letter

Plans for actual manufacture of the Zeder automobile, at the Cleveland Tractor Company's plant in Cleveland, Ohio, were being completed last week. The car will be a light six-cylinder, according to the design of Fred Zeder, who is at present in Newark, N. J., where his engineering headquarters are. Mr. Zeder is closing his connection as chief engineer of the Willys interests. Distribution of the new car will be supervised by E. B. Wilson, formerly sales manager of the Willys Corporation. Meanwhile the selling campaign is being planned by R. T. Hodgkin, of the Cleveland Tractor Company and it is expected that J. O. Hahn, formerly branch manager in Cleveland and Pittsburgh for the Studebaker Corporation, will become identified with the firm. It is probable, officials state, that the capital of the Cleveland Tractor Company, now $6,000,000, may be doubled to provide for the new Zeder enterprise.

The Fisher Body Company's plant at Cleveland, Ohio, will be enlarged at an early date to care for the new business now being booked, it was announced last week. Lease has been taken on the Briggs Manufacturing Company's plant, adjoining the Fisher factory, providing 175,000 sq.ft. additional floor space. It will be used largely for the finishing end of the Fisher production, which at present is for the Chandler, Cleveland and Chevrolet cars.

Indianapolis Metal Trades Elects Officers

The sixteenth annual meeting of the Indianapolis branch of the National Metal Trades Association was held in Indianapolis on March 22. The meeting was well attended and the discussions were participated in by many of the members. The principal address of the day was made by Charles Piez, president of the Link Belt Co. and one-time director-general of the Emergency Fleet Corporation. Mr. Piez devoted his words to a discussion of the work of the citizens of Chicago to enforce the Landis award. He scored the building trades unions in that city and gave some interesting facts concerning their control over municipal affairs.

The election of officers for the coming year resulted in the following choices: President, Stanley Whitworth; vice-president, William Taylor; treasurer, L. M. Wainwright; secretary, A. J. Allen. The executive committee is composed of Arthur R. Baxter, George O. Lockwood and O. B. Iles, elected for two years; and H. G. Myers, Harvey G. Shafer and Alfred Kauffman, elected for one year. The new eleventh district committee is composed of C. C. Hanch, of Connersville, chairman; A. G. Seiberling, of Kokomo; R. P. Johnson, of Muncie; D. E. Ross, of Lafayette; and George M. Dickinson, of Indianapolis.

Another Patent Bill

Under a bill introduced by Senator Ladd, N. D., a patent would expire within five years after its issuance unless the patentee exercised the right to make or use the invention or discovery. In event of the assignment of the patent, the patent rights would extend for two years only if not worked.

Newark To Be Mapped from the Air

The Fairbanks Aerial Camera Corporation, of New York City, has secured a contract to make an aerial map of the City of Newark, N. J. This is said to be the first contract of its kind let by a municipal government.

The city will be sectioned off by topographical experts and each section will be photographed from the air. The photos will then be assembled into a single map which is claimed to show every detail of housing, highway and waterfront construction and layout. The camera used is the invention of Sherman N. Fairchild, president of the corporation.

Pays $100,000 Cash for Factory

Arthur M. Barrett, president of the Barrett Bindery Co., and vice-president of the Barrett-Cravens Co., both of Chicago, Ill., has purchased from the American Chicle Co. the factory building containing 45,000 sq.ft. of floor space, at 1328 West Monroe St., Chicago. Mr. Barrett paid $100,000 cash for this property, and will expend about $25,000 in alterations to meet the particular requirements of the two companies in which he is interested, and which will later occupy the property.

Business Items

Repair shops of the Pennsylvania Railroad at Olean, N. Y., were damaged by a fire which threw 350 men out of work and caused a loss of $100,000.

The Commerce Radiophone Co. has been organized in Detroit, Mich., to manufacture and sell complete radio telephone sets. Production is expected at an early date.

The plant of the Pelton Water Wheel Co., in San Francisco, has been purchased by the Wm. Cramp & Sons Ship and Engine Building Co., of Philadelphia. The Pelton organization will continue operations under the old name, with H. B. Taylor, president; E. C. Hutchinson, vice-president and general manager; and W. M. Moody, second vice-president.

The American Supply and Machinery Manufacturers' Association has removed its headquarters to the Gotham National Bank Bldg., 1819 Broadway, New York City.

The Taft-Pierce Manufacturing Co. of Woonsocket, R. I., has moved its Detroit office from 1311 Majestic Bldg., to 2230 First National Bank Bldg. William Fairhurst is manager of this office.

The Hartford Special Machinery Co., Hartford, Conn., recently added ninety shares of common stock, par value $100, leaving its outstanding stock $247,000.

The factory of the Eastern Woodworking Co., South St., Wallingford, Conn., was destroyed by fire on March 18, causing a loss of about $20,000.

The Singer Manufacturing Co., Bridgeport, Conn., announced last week that its plants will operate on a five-day-a-week schedule. The company has been on a three-day-a-week basis for over a year. A 15 per cent cut in wages will be made also.

The Remington Arms-Union Metallic Cartridge Company's plants at Bridgeport, Conn., resumed a forty-eight-hours per week basis last week. The company has recently received several large orders.

The Shelton Tool and Machine Co., 235 Canal St., Shelton, Conn., recently filed a certificate with the Secretary of the State of Connecticut, changing the name of the concern to the Shelton Cutlery Company.

Handley Bros., Inc., 82 Myrtle St., Meriden, Conn., was recently incorporated under the laws of Connecticut, to take over the plating and buffing business of Handley Bros., same address. The following officers were elected: President, George Handley; secretary and treasurer, John Handley.

The Kenyon Bearings Co., Inc., 102 Allyn St., Hartford, Conn., has been incorporated under the laws of Connecticut, to engage in the machinery and tool business. The capital stock of the concern is $20,000. The company was organized with the following officials: Harold M. Kenyon, president and treasurer; C. C. Thompson, secretary. The directors are the two above-mentioned and William B. McDonald.

The Stacks Engineering Co., Hartford, Conn., recently filed papers of incorporation with the Secretary of State of Connecticut, to engage in the manufacture of machinery, and to render engineering advice. The capital stock is $50,000 and the incorporators are: Don H. Stacks, of 181 North Whitney Ave., Hartford; W. H. Marrin and J. H. Lancaster, both of Litchfield, Conn.

The Bridgeport Rolling Mills, Inc., Bruce and Stratford Aves., Stratford, just over the city line of Bridgeport, Conn., held its annual meeting this week, and elected the following directors for the ensuing year: William R. Bull, George D. Stearns, Anker S. Lyhne and Anton C. Raffauf. Officers elected were: President, William R. Bull; vice-president and general manager, George D. Stearns; secretary and treasurer, Anton C. Raffauf. The company is now working on a 55-hours-a-week basis, and the shop is operating at 90 per cent capacity.

The United States Hoffman Machinery Corporation, a Delaware corporation, has filed papers with the secretary of state at Indianapolis qualifying it to do business in Indiana. The company has $5,500 of its capital stock represented in Indiana. The concern will manufacture and deal in pressing machines. Joseph F. Dunn, of Indianapolis, is named as Indiana agent.

The Meadeville Machinery Co. has leased the Huntington, Ind., shops of the Erie Railroad, including the roundhouse and back shops, or what is known as the locomotive department.

D. C. Oviatt & Co., dealer in new and used machinery, has removed from Euclid Ave., to 1106 St. Claire Ave., Cleveland, Ohio.

Personals

J. R. CAMM, of the Milwaukee office of Kearney & Trecker, has been appointed assistant manager of the Cleveland, Ohio, office.

J. F. HAGAR has been appointed chief engineer of the St. Louis Automatic Corporation, St. Louis, Mo.

ROBERT M. GATES has joined the Superheater Co., with headquarters in the home office, 17 East 42nd St., New York City.

HAROLD D. RICHARDS, formerly in charge of the materials department of the Kewanee, Ill., plant of the Walworth Manufacturing Co., manufacturers of tools and heating supplies, recently returned to the Gilbert & Barker Manufacturing Co., Springfield, Mass.

HUGO BILGRAM, president of the Bilgram Machine Works, Philadelphia, Pa., was held up by bandits on March 21 and robbed of $800, part of a payroll he had just drawn from a bank. The thieves were not captured.

ROBERT GREGG was elected president of the Atlantic Steel Company, Atlanta, Ga. Mr. Gregg has been with this concern for sixteen years. He succeeds Thomas K. Glenn, who recently resigned.

CHARLES MORGANA has resigned as vice-president and director of the C. H. Wills Co., Marysville, Mich. He will become general superintendent of the Detroit plants of the Maxwell Motor Corporation. Mr. Morgana was at one time in charge of the machine tool department of the Ford Motor Co.

FRANKLIN G. SMITH, president and general manager of the Osborn Manufacturing Co., Cleveland, Ohio, returned on March 25 from a two months' business trip to Europe.

S. M. KINTNER has been appointed manager of the research department of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.

HENRY HARNISCHFEGER, president of Pawling & Harnischfeger, Milwaukee, Wis., and also of the Associated Machinery Corporation, has arrived in Rangoon, Burma. Mr. Harnischfeger is on a business trip through Europe and the continent. He reports a good outlook for business.

CHARLES A. SARGEANT has been elected president of the Domhoff & Joyce Co., Cincinnati, Ohio, pig iron brokers. He succeeds his father, the late Col. John Sargeant.

W. H. ASHBAUGH, of Leechsburg, Pa. has been appointed successor to William H. Weichsel, as superintendent of the Dover, Ohio, works of the American Sheet and Tinplate Co. Mr. Weichsel resigned to become manager of the Inland Steel Company's plant at Indiana Harbor, Ind.

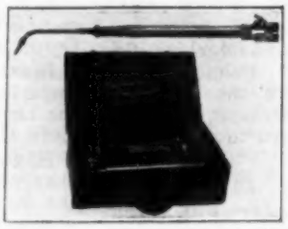
A. F. MURPHY, superintendent of the Zanesville plant of the American Rolling Mill Co., has been made plant manager. W. R. Barnett, who has been assistant superintendent, will become superintendent.

FRED W. HEISER, superintendent of the Timken-Detroit Axle Co., Canton, Ohio, has resigned.

Condensed-Clipping Index of Equipment

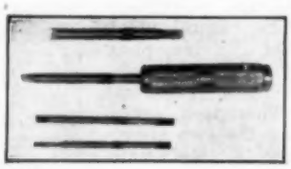
Patented Aug. 20, 1918

Welding-Torch Outfit, Oxy-Acetylene, Garage
Davis-Bournonville Co., Jersey City, N. J.
"American Machinist," November 24, 1921.



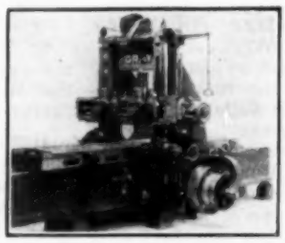
The outfit is intended for repairing broken metal parts of all sorts, and is capable of handling the usual types and sizes of welding work encountered in the small shop. The fiber case is provided with partitions for holding the various parts. The outfit consists of the concern's No. 7,000 welding torch, with three extension tubes, one decarbonizing tube and five tips; an oxygen and a hydrogen regulator, with hose and connections; a spark lighter; colored glasses; and a torch wrench and regulator wrench. Various types of rods and fluxes can be furnished for use with the torch.

Screwdriver Set, Detachable-blade, No. 60
Consolidated Tool Works, Inc., New York, N. Y.
"American Machinist," November 24, 1921.



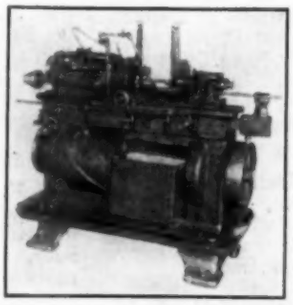
The tool is intended for heavy work and is strongly made. Four hardened and ground tool-steel blades are provided, the widths being $\frac{1}{4}$, $\frac{5}{16}$, $\frac{1}{2}$ and $\frac{5}{8}$ in. The handle is turned from a solid bar of cold-rolled steel, and is knurled. The blades are interchangeable in the handle. The two smaller blades are fitted at one end and the two larger ones at the other. They are secured without the use of any moving jaws. The blade is prevented from turning in the handle by a stop which bears against the flat surface on the tang. The assembled tool is 6$\frac{1}{2}$ in. long.

Planer, "Maximum Service"
G. A. Gray Co., Cincinnati, Ohio.
"American Machinist," December 1, 1921.



The control of the machine is centralized. The feed motion is positive, and adjusted by knobs until the required feed is indicated on graduated dials. The rail-head and side-head feeds are independent. The rapid traverse motion is applied to the side-heads, as well as to the rail-heads, while neither the motor nor any part of the rapid-traverse mechanism is in motion unless a head is actually being moved. A stirrup controls the rail elevation. The motor that operates the rapid traverse motion also furnishes the power for setting the rail. The bed of the planer is made full length, forming a rigid support. Helical gearing drives the table, while bronze thrust collars take the resultant end thrusts.

Lathe, Engine, Full Automatic
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," December 1, 1921.



The lathe is completely automatic in introducing and gripping the work, turning shoulders and ejecting finished pieces. It has all the features of an engine lathe: a pair of centers to support the work, a loose work driver, a cross-slide carriage and a toolpost. The traverse movement is actuated by drum and face cams. The work is fed from a magazine. The machine is made in two sizes, and with cone or geared head. Four changes of speed of the automatic movement are provided for each spindle speed on the larger machine and three on the smaller. Length of work: large machine, 3$\frac{1}{4}$ to 15 in.; small machine, 2$\frac{1}{4}$ to 11 in. Diameter of work $\frac{1}{8}$ to 1$\frac{1}{4}$ in. and $\frac{1}{4}$ to $\frac{5}{8}$ in., respectively. Weight, 2,750 and 1,625 lb., respectively.

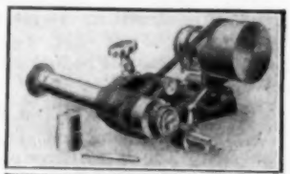
Caliper, Thickness
Bausch & Lomb Optical Co., Rochester, N. Y.
"American Machinist," November 24, 1921

The device is intended to give a means of easily measuring diameter or thickness, being originally developed for determining the thickness of lenses. The two legs are of U-form, to give strength. The pivot is provided with a bronze bearing adjustable for wear. The measuring points are made of hardened steel, and the ends have a spherical form. A locking screw adjustment is provided at each point. The scale fastened to one of the legs can be graduated to read in either thousandths of an inch or in tenths of a millimeter. The maximum capacity is 12 mm. or $\frac{1}{2}$ in.

Tag, Identification, Toolmakers'
L. J. Hogarty Co., 5 Beekman St., New York, N. Y.
"American Machinist," November 24, 1921.

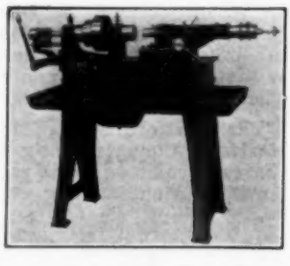
The device is intended for use by toolmakers and machinists, where one man is not assigned permanently to one machine. Each operator has one tag, bearing his check number. His name is on a metal band so fastened on the tag that it can be removed and replaced by another band. When an operator starts to use any machine in the shop he attaches to it his identification tag, which indicates that the machine is occupied. This method is intended to displace the more common one of putting a tool or cutter in a machine to show that the latter is in use, or else being held for future use. On the face of the tag are printed some rules regarding the care and operation of machine tools.

Grinding Spindles, Internal and Face, "Fortuna"
Coats Mahine Tool Co., Inc., 110 West 40th St., New York, N. Y.
"American Machinist," December 1, 1921.



The type J spindle is for horizontal internal grinding where no heavy axial thrusts are encountered. The work sizes are from a $\frac{1}{2}$-in. hole and 2$\frac{1}{2}$-in. depth to a 2$\frac{1}{2}$-in. hole and a depth of approximately 20 in. The type D spindle is for both internal and face horizontal grinding. The type DD spindle is for vertical internal and face grinding, as well as for grinding internal radial grooves. The minimum work diameter with types D and DD is 1$\frac{7}{8}$ in. with a maximum depth of 9$\frac{1}{2}$ in., and a minimum diameter of 4$\frac{1}{2}$ in. with a maximum depth of 36 in. With abrasive pencils, holes 5/64 in. in diameter may be ground to a maximum depth of $\frac{11}{16}$ in., or $\frac{7}{8}$ in. with a maximum depth of 1$\frac{1}{2}$ in.

Drilling Machine, High-Speed, Horizontal
Acme Machine Tool Co., Cincinnati, Ohio.
"American Machinist," December 1, 1921.



The machine is especially adapted to drilling small deep holes. The work-spindle and chuck operation is identical with that of a hand-screw machine. The drill spindle has a No. 1 Morse taper for holding the drill chuck. It is driven by a flanged pulley and is moved backward and forward by a pilot wheel, while the spindle collar acts as a stop gage. The spindle is held in a casting adjustably mounted on a sliding saddle. It is ordinarily run at about 3,000 r.p.m. Since the work spindle speed is 500, a drilling speed of 3,500 r.p.m. is obtained.

Clip, paste on 3 x 5-in. cards and file as desired

WALTER RADTKE, chief metallurgist at the plant of the Canton Sheet Steel Co., Canton, Ohio, has resigned.

PETER G. SCHILLING, formerly associated with H. S. Johannsen, New York City, is now chief engineer for the American Krupp System-Diesel Engine Co., New York.

ELWOOD B. CROCKER has resigned as a trustee for bondholders of the Havana Bridge Works of the Shepard Electric Crane and Hoist Co., Montour Falls, N. Y.

HARRY G. MOOCK, general manager of the National Automobile Dealers' Association, has resigned that position to become director of merchandising with the Hudson and Essex automobile companies.

FRANK E. SMITH has been elected president of the Republic Motor Truck Co., Alma, Mich.

HARRY FOWLER has been appointed district sales manager of the Cincinnati sales territory for the Carborundum Company, Niagara Falls, N. Y.

CHARLES R. COX has been appointed sales statistician for the Carborundum Company, Niagara Falls, N. Y. He was formerly in charge of the Cincinnati sales territory for that company.

JOSEPH F. DUNN has been appointed Indiana agent for the United States Hoffman Machinery Corporation. His headquarters will be in Indianapolis.

W. C. ALLEN, former manager of the Philadelphia branch of the Black & Decker Co., has been appointed district manager of the Chicago territory. This includes the states of Wisconsin, Illinois, Missouri, Iowa, Minnesota and North Dakota.

C. E. SKINNER, manager of the research department of the Westinghouse Electric and Manufacturing Co., has been appointed assistant director of engineering in that company. His duties will cover research, standards and other work along those lines. He will be located in the main engineering offices of the company at East Pittsburgh, Pa.

S. W. LINDHEIMER, formerly vice-president of the Walter A. Zelnicker Co., St. Louis, dealers in sheet piling, track accessories, railroad and contractor's equipment, who on October 1, 1921, was placed in charge of Zelnicker's Chicago office, has now gone into business for himself, handling similar lines as above. He is located at Room 428, First National Bank Bldg.

G. H. PFEIF has been appointed director of industrial relations at the Schenectady plant of the General Electric Company, succeeding E. B. Merriam who recently became executive engineer of the switchboard department. As director of industrial relations Mr. Pfeif will have supervision over the employment, education and training, compensation, hospital and safety work of the Schenectady plant.

ARTHUR WHITCRAFT, for a number of years successively with the Marion Steam Shovel Co., American Locomotive Co., and New York Central Railroad, in charge of erection, operation and supervision of heavy excavation machinery, and for twelve years with the American Manganese Steel Co., as sales engineer engaged in the design application and sale of manganese steel castings, has assumed charge of the manganese steel sales department of the Hadfield-Penfield Steel Co., with headquarters at Bucyrus, Ohio.

WILLIAM J. SMITH has recently joined the Gilbert & Barker Manufacturing Co., Springfield, Mass., organization, as assistant superintendent of the foundry division. Mr. Smith was formerly equipment engineer with the McNab & Harlin Co.

ALLAN D. COLVIN, assistant general manager of the Hartford Electric Light Co., Hartford, Conn., has been appointed as a graduate lecturer of the Department of Electrical Engineering, at Yale University, New Haven, Conn.

W. J. METCALF, manager of the stock and order department of the Yale & Towne Manufacturing Co., Stamford, Conn., has been appointed as assistant to president Walter C. Allen of the company, and will take up his new duties immediately. Mr. Metcalf, has been with the company since 1902.

Obituary

EDWARD M. BARR, manager of the Chicago office of the Chisholm-Moore Manufacturing Co., of Cleveland, Ohio, died suddenly in Chicago on March 15.

HENRY A. LAUGHLIN, director in the Jones & Laughlin Steel Co., Pittsburgh, Pa., died at his home in Philadelphia on March 22. He was 83 years old and had been in the steel business for the past sixty years.

JOHN A. HURLEY, retired manufacturer of Bridgeport, Conn., died at his home in that city on March 20. Mr. Hurley has been ill for the past two years, and was confined to his home for some time past. He was head of the Hurwood Manufacturing Co., manufacturer of sheet metal goods, etc., which was organized in Meriden, Conn., removing to Bridgeport in 1903. In 1911 the Hurwood Manufacturing Co., sold out to the Coe-Stapley Manufacturing Co., which later removed to West Haven.

JAMES A. DOUGHTY, president of the Torrington Manufacturing Co., manufacturer of machinery, brass goods, etc., Torrington, Conn., died suddenly at his home on March 15. Mr. Doughty was seventy-one years old, and was well known in industrial circles of the eastern states.

Book Reviews

Survey of Elevator Interlocks and an Analysis of Elevator Accident Statistics. Technologic Paper No. 202 Bureau of Standards; can be obtained from Superintendent of Documents, Government Printing Office, Washington, D. C., price five cents.

This report presents the results of an inspection of the interlocking mechanisms on several thousand elevator landings, the performances being classified into groups on a basis of service and maintenance conditions; a comparison of the advantages and disadvantages of the various types of devices is given, together with causes of breakdown under service. A number of tables of elevator statistics is given, the statistics being further classified as "shaft-door" and "non-shaft-door." A general discussion of the statistics follows. The interlock requirements of the A. S. M. E. Elevator Code are quoted in conclusion.

The report was prepared by C. E. Oakes, electrical engineer, and J. A. Dickinson, mechanical engineer, of the bureau.

Electric Arc Welding. By E. Wanamaker and H. R. Pennington, electrical engineer and supervisor of electrical equipment, respectively, Chicago, Rock Island & Pacific Railroad. 257 6 x 9-in. pages. Simmons & Boardman Publishing Co., New York City. Price $4.

This is a practical book by practical men, and contains much information for those who would apply the electric arc process of welding to their own problems. Starting with a brief outline of the origin of the process, the reader is informed upon the theory and principles of the process, the apparatus and equipment required, and is shown practical applications of arc welding to railroad and structural repairs.

Forthcoming Meetings

National Metal Trades Association: Annual convention April 17 to 20, Hotel Astor, New York City. H. W. Fisher, 1022 Peoples Gas Building, Chicago, Ill., secretary.

American Gear Manufacturers' Association: Sixth annual meeting, Buffalo, N. Y., April 20 to 22. Secretary, F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Southern Supply and Machinery Dealers Association: Annual meeting, Birmingham, Ala., April 24 to 26. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, A. M. Smith, c/o Smith-Courtney Co., Richmond, Va.

National Machine Tool Builders' Association: Spring convention, Hotel Traymore, Atlantic City, N. J., April 25 and 26. Ernest F. DuBrul, 817 Provident Bank Bldg., Cincinnati, Ohio, general manager.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 13. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

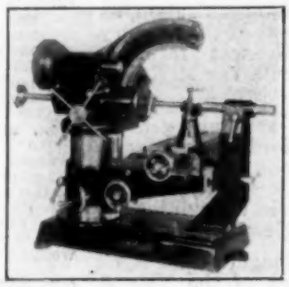
Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Combination Machine; Bench-Type; Lathe, Milling and Drilling
Triplex Machine Tool Corp., 18 E. 41st St., New York, N. Y.
"American Machinist," December 1, 1921.

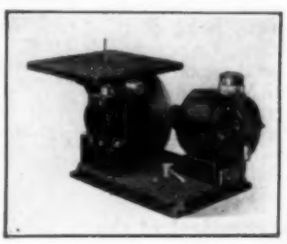


The machine provides a complete machining equipment, requires little bench space, and is motor-driven and hand-fed throughout, with the exception of the feed when screw cutting. The head can be shifted so as to operate at any angle. The spindle is driven by a ¼-hp. reversible ball-bearing motor running at a speed of 1,750 r.p.m. It will hold either a faceplate, spring collet or a chuck. There are six spindle speeds of from 90 to 1,150 r.p.m. Table, 5 x 14½ in. Feed: longitudinal, 10 in.; transverse, 6 in.; vertical, 4½ in. Spindle travel, 3 in. Swing: over table, 8 in.; over ways of bed, 14½ in. Center distance, maximum, 14 in. Diameter of milling arbor, ⅞ in. Spring collet capacity, ½ in. Bench space, 16 x 26 in. Maximum height, 43 in. Weight, 450 lb.

Welding Machine, Arc, Semi-Automatic, G. E.
General Electric Co., Schenectady, N. Y.
"American Machinist," December 1, 1921.

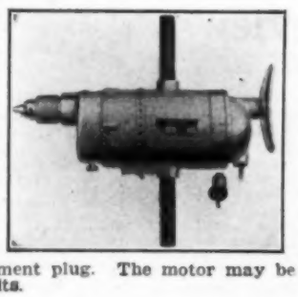
The welding tool is directed by the operator and guides the electrode wire. It has a switch in the handle for operating the control on the panel. The device has a 10-ft. length of flexible steel tubing, to which is attached the automatic welding head. The wire passes from the feed rolls of the head through the flexible tubing and guide nozzle to the arc. The machine may be used for welding seams of irregular contour, or for large work where the travel mechanism and clamping would be too complicated. It is adapted to building up metal rapidly, filling up blow holes in castings, or building up worn spots.

Filing Machine, Die, Bench
R. G. Haskins Co., 27 S. Desplaines St., Chicago, Ill.
"American Machinist," December 1, 1921.



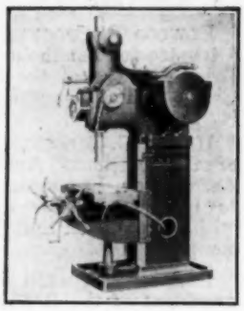
The machine is motor driven through a friction disk at speeds ranging from 300 to 700 strokes per minute, filing steel as well as brass and other soft metals at their proper cutting speeds. The motor is ¼ hp. and is provided with ball bearings. A hardened and ground steel block and guide impart the reciprocating motion. The grooved table is 9 in. square and is adjustable to any angle. The driving spindle is of nickel steel, heat-treated and ground. Standard filing-machine files are furnished in sets of twelve in various shapes, the shanks being ¼ in. in diameter. The machine is light and portable.

Drill, Electric, Portable, "Power King"
Jones, MacNeal & Camp, 533 S. Clinton St., Chicago, Ill.
"American Machinist," December 1, 1921.



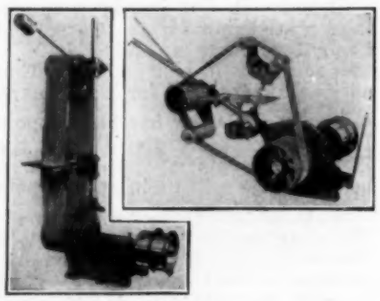
The body of the drill is built in three sections, that nearest the chuck containing the gears. The middle section holds the motor, switch and wiring, while the rear section is a protecting cap. The breast-plate is interchangeable with a handle or a feed screw. The spindle, armature shaft and drive shaft run on ball bearings, the spindle bearings being of the combination radial and thrust type. The drill is made in eight sizes for drilling holes from ⅛ to 1 in., and with spindle speeds of 1,400 to 2,400 and 300 to 375 r.p.m. The equipment includes fifteen feet of cord and an attachment plug. The motor may be furnished for either 110 or 220 volts.

Drilling Machine, Heavy-Duty, Upright, No. 6
Colburn Machine Tool Co., Cleveland, Ohio
"American Machinist," December 1, 1921.



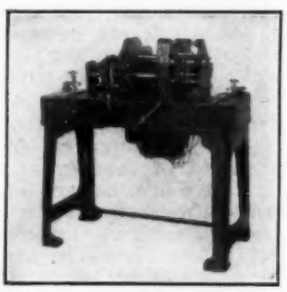
Speed and feed controls are centralized on the front of the machine. Sliding gears give two quick changes of speed, and transposing gears furnish 48 spindle speeds from 30 to 375 r.p.m. A handwheel controls two feeds having a ratio of 3 to 1, and change gears give 36 feeds from 0.005 to 0.134 in. per spindle revolution. A geared tapping attachment, an extended base, or a machine having gangs of two, three or four spindles can be furnished. Capacity in steel 3 in. Swing, 28 in. Vertical table adjustment, 13 in. Total height, spindle up, 115 in. Floor space, plain table, 33 x 63½ in.; compound table, 65 x 71 in. Net weight: with plain table, 4,020 lb.; compound table, 4,545 lb.

Sanding Machine, Belt, "Variety," No. 127
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," December 1, 1921.



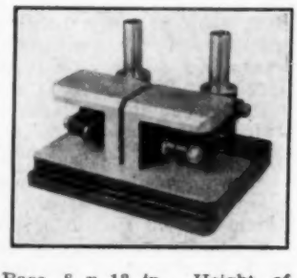
This machine is equipped with an edging attachment and a fork idler for oval sanding. The edging table is 10 x 12 in. and can be tilted 30 deg. The backing plate is 10 in. wide. It is adjustable to vary the belt tension, and is replaceable with special flexible pads. Both the main and tension idlers are adjustable, roll on ball bearings and are leather covered. The sanding belt is 10 in. wide and 14 ft. long. The machine can be furnished with either belt or motor drive. Weight boxed for export, 650 lb.

Drilling and Boring Machine, Crankcase
Manufacturers' Consulting Engineers, Syracuse, N. Y.
"American Machinist," December 1, 1921.



The machine is equipped with a driving motor and two movable heads, which can be fed in opposite directions by a hand lever. Each head carries a number of drills and a boring head, the number depending on the character of the operation. The machine illustrated carries three drills and one boring head in each of the movable heads, and is intended for drilling and boring crankcases for the attachment of starters and generators.

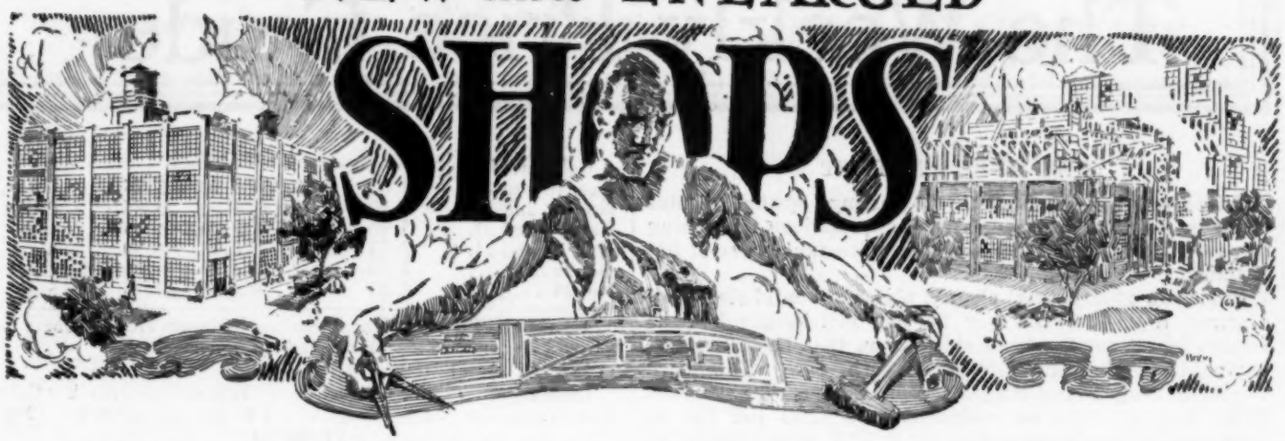
Fixture, Drilling, Universal
Hartman Manufacturing Co., 308 Pearl St., Hartford, Conn.
"American Machinist," December 1, 1921.



The fixture is used in drilling irregular-shaped pieces, and consists of an accurately scraped base block and two adjustable angle plates. One edge of each of the small angles on the plates is bevelled to 45 deg., forming a V for holding round pieces, or with the angles out of parallel holding tapered pieces with the upper surface either level or at a slant. By rearranging the angle blocks, an internal angle or two parallel surfaces can be secured. The base, angle blocks, and clamping arms are cast iron, while the swivel posts and clamping bolts are heat-treated steel. Base, 8 x 12 in. Height of posts, 7½ in. Weight, approximately 60 lb.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Ala., Birmingham—The Brilliant Coal Co., American Trust Bldg.—one electric drum hoist to be used for pulling loaded mine cars from mine.

Ala., Birmingham—The East Pratt Coal Co., 601-3 Chamber of Commerce Bldg., T. Morgan, Genl. Mgr. and Purch. Agt.—one small lathe, 30 in. between centers and three speed pulley for cast iron and forged work.

Ariz. Nogales—G. Corelka, Jr., P. O. Box 1175—creamery machinery.

Ark., Dukey Heights (Sulphur Springs P. O.)—F. L. Armstrong, farmer—small tools and sawing machinery.

Ark., Fort Smith—H. N. Hall, 316 First Natl. Bank Bldg.—machinery for the manufacture of paper boxes including candy boxes, etc.

Conn., Stratford—J. F. Stone, Canaan Rd.—one power rip and cut-off saw, and one jointer, (used).

Cal., Los Angeles — The Westinghouse Electric & Mfg. Co., Van Nuys Bldg.—five traveling cranes for proposed warehouse on 5th and San Pedro Sts.

Ga., Atlanta—The Fulton Bag & Cotton Mills, 10 South Blvd., Atlanta, N. E. Elsas, Secy. and 643 Security Bldg., Minneapolis, Minn.—machinery and equipment for proposed factory at Minneapolis.

Ga., Dalton—The Farrar Lumber Co., F. F. Farrar, Secy.—10-12 in. outside moulder and small band resaw, must be thoroughly modern and up to date.

Ga., Macon—J. S. Schofields Sons Co., Hammond and Boundary Sts., V. A. Vail, Purch. Agt.—heavy duty plate drill to drill plates for boilers, delivery Macon, (used).

Ia., Des Moines—The Des Moines Printing Exchange, 310 2nd St.—one 16 x 19 in. lever cutter.

Ill., Chicago—The Atchison, Topeka & Santa Fe R.R., 80 East Jackson Blvd., M. J. Collins, Purch. Agt. $724,281 worth of shop machines and tools.

Ill., Chicago—The Merkle-Korff Gear Co., 313 South Clinton St., A. Merkle, Purch. Agt.—shop machinery complete outfit.

Ill., Chicago—The Paragon Mfg. Co., 3225 Ravenswood Ave., A. Roehrl, Purch. Agt.—one No. 2 Brown & Sharpe milling machine, late type, and one surface grinder.

Ill., Chicago—F. H. Rawson, 7 South Dearborn St.—two Yale & Towne, 3 ton gear chain hoists.

Mass., Boston—A. B. Croke Co., 143 Federal St.—all kinds of photo engravers machinery and equipment, (used).

Mass., Fall River—Fyans, Fraser & Blackway, 83 Anawan St.—one 3 cylinder "Kitson" roving waste machine, (used).

Mich., Detroit — N. J. Aulbach, 4040 Greenwood Ave.—band saw and equipment, 30 in. or smaller.

Mich., Detroit—F. E. Will & Son, 6661 West Fort St.—small bench lathe and drill press.

Mich., Holley—Grinnel Bros.—30 x 72 in. hydraulic veneer press with clamps complete.

Minn., Minneapolis—The Electric Short Line Ry. Co., 7th St. and 23rd Ave., N., W. L. Luce, Pres.—several power machines for handling wheels.

Minn., Minneapolis—The Northwestern Ice Cream Co., 309 19th St., N. E., G. A. Ball, 1942 Hennepin Ave., Secy.—machinery for the manufacture of ice cream, also refrigerating machinery. Estimated cost, $27,000.

Minn., St. Paul—The Twin City Woodworking Co., 450 Cleveland Ave., C. R. Stone, Secy.—woodworking machinery.

Miss., Sessums—J. M. Greene, Middleton, Greene and Dunn Sts.—portable air riveting equipment to handle up to ¾ in. rivets.

Mo., Hammond—Lawsen Bros., J. Lawsen, Purch. Agt.—planer.

Mo., Joplin—The Hibbard Mfg. Co., 1019 East 3rd St., E. H. Shackleford, Purch. Agt.—woodworking machinery, shafting, belting and planing machine.

Mo., Joplin — The Joplin Center Cord Tire Co., 813 Main St.—vulvanizers, rollers, molders and automobile tire making machinery.

Mo., Joplin—The Monarch Garage, 410 Penna St., R. A. Nisely, Purch. Agt.—drill press, lathe, belting and shafting.

Mo., Joplin—The Peerless Motor Sales Co., 409-11 Virginia Ave., G. McFall, Purch. Agt.—drill press, lathe, emery wheel and stand for electric power.

Mo., Kansas City—E. Warren, c/o Coates House—printing press for job work.

Mo., Pineville—The Pineville Canning Co., J. S. Armstrong, Purch. Agt.—machinery and equipment for canning plant.

Mo., St. Louis—J. J. Connors, 3900 Easton Ave.—electric drill.

Mo., St. Louis—Schoellborn-Albrecht Machine Co., 721 North 2nd St.—machinery for machine shop (used).

Mo., Webb City—The Webb City Stone Co., A. S. Kerr, Purch. Agt.—shafting, belting and stone sawing machinery.

Neb., Lincoln—The Lincoln Welding Co., 330 South 10th St.—one 18 in. lathe 10 ft. bed and drill press, (used).

N. J., Jersey City—The Horne Mfg. Co., 243 Mercer St.—one disc grinder.

N. Y., Adams—O. D. Greene Lumber Co.—one adjustable saw table and rack, also one heavy swing cut-off saw.

N. Y., Adams—Shelmidine & Moore Co., Spring St., R. F. Bundy, Purch. Agt.—heavy machine bench vise and hand tapping and threading machine up to 2½ in.

N. Y., Bath — The Pine Grove Stock Farm, D. M. White, Purch. Agt.—electric driven milk and cream handling, cooling and pasteurizing and ice cream making machinery and equipment.

N. Y., Brooklyn—P. W. Stange, 64 North 9th St.—one electric spot welder.

N. Y., Buffalo—The Behringer Planing Mill Co., 177 Imson St.—one 30 in. shaving fan and one automatic knife grinder.

N. Y., Buffalo—D. Calabuse, 655 Ellicott St.—tinners tools; 30 in. roller; 30 in. folder; small edging machine.

N. Y., Buffalo—Whistler & Schanland, 1283 Niagara St.—japaning oven and tumbling barrel.

N. Y., Burrs Mills—The Cascade Milk Corp., C. A. Brown, 235 High St., Watertown, Purch. Agt.—milk handling machinery and transmission equipment.

N. Y., Cameron—The C. Meyers Co.—drill press, bench miller power grinder and hack saw, (new or used).

N. Y., Carthage—The Champion Paper Co., Lathrop St.—pipe threading machine.

N. Y., Dolgeville—The Dolgeville Felt Shoe Co., Faville Ave.—three 1½ ton triple chain hoists, also roller conveyor equipment.

N. Y., Elmira—The Bd. Educ., City Hall—eleven paper baling presses.

N. Y., Elmira—J. L. McInerny, 311-17 State St.—forge and blower equipment; light lathe, (used); arbor press and power hammer, (light).

N. Y., Harrisville—J. De Graff—portable forge and blower, also concrete brick machine.

N. Y., Jamestown—The Falconer Street Garage, 253 Falconer St.—large chain hoist.

N. Y., Little Falls—The Barnet Leather Co., Inc., 598 East Mill St., E. L. White, Purch. Agt.—special machinery for handling, treating and manufacturing of leather.

N. Y., Lowville—The Virklers Machine Shop, A. N. Virkler, Purch. Agt.—hydraulic trunk tire setter, also parts for built-in forger including electric driven blower and equipment.

N. Y., Lyons Falls—The Gould Paper Co.—pulp stone dressing tools, 2½ ton triple geared hoist.

N. Y., Newburgh — The Hudson River Woolen Mills—one 40 in. cloth opening machine.

N. Y., New York—The Amster Constr. Co., 705 East 133rd St.—one cornice brake, 8 ft.

N. Y., Ogdensburg—The Monnet Bedding & Upholstery Co., Inc., E. O. Monnet, Purch. Agt.—machinery and equipment for the manufacture of mattresses, also upholstery spring winding machinery.

N. Y., Ogdensburg—The Universal Reclining Chair Co., Inc., (wooden chairs), A. F. Whalen, Purch. Agt.—electrical sanding equipment and swing cut-off saw.

N. Y., Rochester—The Continental Products Co.—elevating, screening and grading machinery for proposed sand and gravel storage bins.

N. Y., Rochester—G. Erlwein, 568 Lake Ave—complete outfit and machinery for bakeshop.

N. Y., Silver Creek—The Thompson Fdry. Co., Oliver St., F. Thompson, Purch. Agt.—iron and brass foundry equipment and heat treating equipment.

N. Y., Silver Creek—F. R. Thompson—one engine lathe, one drill press and other machinery for small foundry.

N. Y., Syracuse—W. M. Wischeroth, 100 Otisco St.—boiler to develop about 40 hp. or more, also two or three vats, 4 x 4 x 12 by ¼ in. thick.

N. Y., Troy—The Troy Yarn Co., 20 River St., one Davis and Furber twisting machine for making 2 ply yarn, (used).

The Weekly Price Guide

THIS WEEK'S MARKET

Prices of gray iron machinery castings quoted in nine cities in this week's issue. Weekly quotations on casting rates will hereafter include several additional centers of importance.

Producers of structural shapes, plates and mild steel bars continue to quote $1.50 per 100 lb., Pittsburgh; but the market is not yet firmly established on that basis. Actual buying is possible at $1.40@$1.45 f.o.b. mill. New York warehouses quote steel shapes and plates at $2.48 as against $2.63; bars at $2.38 as compared with $2.53 per 100 lb. Cleveland quotes shapes and plates at $2.31 as against $2.46; bars at $2.21 as compared with $2.36 per 100 lb. one week ago. Demand for steel sheets greater than for any other steel product, and prices are beginning to show upward tendencies.

Spelter quoted in New York warehouses at 5⅞c., as against 5¼c.; antimony at 5c. as compared with 5¼c. per lb. last week. Copper shows no improvement in demand but rising tendency in prices seems somewhat checked. Lead market steadier; tin firm.

Linseed oil quoted at 83c. as against 84c.@87c. per gal. in New York.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.52
Northern Basic	21.02
Southern Ohio No. 2	21.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.16
BIRMINGHAM	
No. 2 Foundry	17.65
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	21.76
Virginia No. 2	26.74
Basic	21.00
Grey Forge	19.65
CHICAGO	
No. 2 Foundry local	20.00
No. 2 Foundry, Southern, sil 2.25@2.75	21.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	18.75
Basic	18.00
Bessemer	19.50

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.5
Philadelphia	8.75	5.5	2.65
Atlanta	5.0	4.0	3.5
Detroit	7.0	4.5	3.0
Birmingham	...	8.0	3.0
Denver	8.0	6.0	5.0
New Orleans	9.0	6.0	3.0
Minneapolis	9.0	6.0	4.5
New York	8.5	6.0	3.0

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	3.75@3.90	3.75	4.15
Nos. 12 and 14.	3.10	3.85@4.00	3.85	4.25
Nos. 17 and 21.	3.40	4.15@4.30	4.15	4.55
Nos. 22 and 24.	3.55	4.30@4.45	4.30	4.70
No. 26	3.70	4.45@4.60	4.55	4.85
No. 28	4.00	4.75@4.90	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	71	58½	¾ to 1¼	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1¼	69	57½	¾ to 1¼	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.56	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.35	3.00	3.40
Cold finished flats, squares	3.85	3.50	3.90
Structural shapes (base)	2.48	2.31	2.63
Soft steel bars (base)	2.38	2.21	2.28
Soft steel bar shapes (base)	2.38	2.21	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.48	2.31	2.38
Bar iron (2.00@2.10 at mill)	2.38	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅜	8.50		12@13
⅛	7.15		11@12
5/32 to ¼	6.75		10@11

High speed steel is quoted in Cleveland at 90c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	30.25
Lead (up to carlots), St. Louis, 4.65; New York	5.00
Zinc (up to carlots), St. Louis, 5.02½; New York	5.37½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.00	6.50	6.75
Copper sheets, base	19.50@20.50	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.25	15.00	15.75
Brass wire (carlots)	16.75	16.50	.....
Zinc sheets (casks), (8% dis. carlots)	10.50	9.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J	44.00	.....	..
Solder (½ and ¼), (case lots)	19.00	22.00	19.00
Babbitt metal (best grade)	32.00	41.00	36.0
Babbitt metal (commercial)	16.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.50
Copper, heavy, and wire	9.50	10.00	9.50
Copper, light, and bottoms	8.50	8.50	8.75
Lead, heavy	3.75	3.50	3.50
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.50
Brass, light	4.25	4.25	5.00
No. 1 yellow brass turnings	5.00	5.00	5.25
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.83	.99	.97
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@3.50	
Coke, prompt foundry, Connellsville	per net ton	4.25@4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60-5%	60-10%	60-10-10%
1½ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Square and hex., head cap screws	75—10%	75%	.....
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75-10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, ⅛ in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.35	$3.25	$3.00
Cone heads, ditto (net)	3.45	3.35	3.10
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60-5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.55
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50-5%	60-10%
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	.....
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4 95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	....	3.20

N. Y., Watertown — Lucas & Smith, Jackman St., R. Smith, Purch. Agt.—small size vertical post drill; carbon twist drills in set; woodworking saw table for 24 in. saw.

N. Y., Watertown — The Watertown Boiler Wks., West Main St., D. Corbet, Purch. Agt.—compressor, tank and pneumatic riveter.

N. Y., Woodside (Flushing P. O.)—The Star Novelty Mfg. Co., 25 Levrich St.—one No. 19 Bliss press; one Anderson rotary filling machine; one small shaper.

N. Y., Woodville—G. D. Coulter—woolen weaving machinery, line shafting and transmission equipment.

N. C., Eller—C. W. Rothrock & Sons, manufacturers of wood products, C. W. Rothrock, Purch. Agt.—self feed rip saw, tooth saw, 300 hp. engine, 40 hp. boiler, etc.

N. C., High Point—The Royer Ferguson Co., R. Ferguson, Mgr.—locomotive crane to handle 1 yd. clam shell or orange peel bucket, full revolving, rail truck or road traction mounting (used); also a small locomotive, Plymouth or Burton preferred, and about 10,000 ft. of 24 in. gauge 20 lb. industrial track.

N. C., Salisbury—The Wyatt Granite Paving Block Co., P. O. Box 10 R.F.D. No. 3—small gasoline engine and hoister combined, capacity one or two tons.

O., Cincinnati—The Eastern Mchy. Co., 408 East Pearl St., A. Smith, Purch. Agt.—one No. 1½, 2 or 2½ universal milling machine; power punch press, 1,000 lb. pressure, Willard or Bliss.

O., Cincinnati—Jones Machine Tool Co., 435 Pearl St., C. Jones, Purch. Agt.—one 1,000 ampere plating dynamo, 10 volts; standard stamping press equal to No. 5 Toledo; small quick change lathe 14 in. or 16 in. swing, with 6 ft. or 8 ft. bed; one 1½ in. bolt cutter; two 8 ft. bending rolls, one for ¼ in. and one for No. 10 plate.

O., Cleveland—The Amer. Steel & Wire Co., Western Reserve Bldg.—various size lathes.

O., Cleveland—The Bd. Educ., Rockwell Ave. and East 6th St., S. E. Hyre, Clk.—two printing presses; two lever paper cutters; two proof press stands; type; two cabinets and imposing tables; two variety bench saws; two 30 in. band saws; two hand jointers; two combined oil stone grinders; two quick change gear lathes; two bench drill presses; two wheel electric grinders; two 30 in. squaring shears; two bar folding machines; two combined punch and shear machines; two forming boilers; two burring machines; two turning machines; two wiring machines and two hand forges.

O., Cleveland—The A. H. Robinson Co., 5103 Detroit Ave.—one electric arc welding machine.

O., Marietta—Patton Bros. (foundry)—one large pneumatic rollover.

Okla., Ponca City—The Municipal Water & Light Dept., P. R. Dunton, Supt.—one 11 in. x 4 ft. bench lathe with milling attachment and draw chuck (used).

Pa., Erie—The Blyestone Mfg. Co. of Cambridge Springs, will take over the plant of the Triangle Tool Co., 8th and Holland Sts., here, and install material and machinery for the manufacture of concrete block and concrete mixing machinery. This plant is to be operated (it is reported), only until Cambridge Springs plant, which was destroyed by fire, can be rebuilt.

Pa., Monongahela—The Coshocton Iron Wks., Axleton St.—one 10 ton, one 5 ton and two 2 ton cranes.

Pa., New Britain—H. A. Voss—automatic hosiery machines for new mill at Lansdale.

Pa., Phila.—The Andross Worsted Co., Bridge and Charles Sts., J. Lee, Pres.—looms, winders, throwers, machine shop equipment, shafting, belting, etc.

Pa., Phila.—J. G. Boggs, 1910 North 4th St.—lathes, shapers, millers and belting.

Pa., Phila.—J. A. Dodds, 2929 Ellsworth St.—small double drum, hoist engine and boiler.

Pa., Phila.—The J. C. H. Automatic Machine Wks., 2434 North Fairhill St.—one 2 ton high speed chain hoist.

Pa., Phila.—F. W. Mauer & Sons Co., Wayne Ave. and Bristol St.—five thousand 3 x 5 spools for Prince Smith roving frames.

Pa., Phila.—The North Eastern Ice Mfg. Co., Front and Luray Sts.—ice manufacturing and conveyor machinery.

Pa., Phila.—The Sobel Machine Co., 880 North 40th St.—one No. 2 Brown & Sharpe or similar surface grinder.

Pa., Pittsburgh—The Allegheny County Comrs., R. D. Schorley, County Rd. Comr.—mechanical conveying equipment for two asphalt plants.

Pa., Pittsburgh—R. M. McAnulty, Park Bldg.—jack hammer and air compressor.

Pa., Pittsburgh—The West Leechburg Steel Co., Farmers Bank Bldg.—sixteen inch continuous hot strip mill with auxiliary equipment.

S. C., Charleston—M. A. Deegan, East Henrietta St.—complete line of machinery and equipment for the manufacture of cement roofing tile.

Tenn., Memphis—The Memphis Fender & Enamel Wks., 52 South 4th St., F. H. May, Prop.—machinery, equipment, etc., for use in straightening fenders.

Tex., Austin—N. K. Brown, State Hy. Dept.—ten ton ice manufacturing plant.

Tex., Beaumont—The Brooks Supply Co., 799 Franklin St.—one 54 in. boring machine; 18 in. x 16 ft. lathe and milling machine.

Va., Leesburg—B. H. Branch—canning machinery and outfit (new or used).

Wash., Aberdeen—The Port of Grays Harbor, office of Comn., 206 East Wishkah St., F. H. Lamb, Pres.—receives bids until April 11 for one 5 ton, 95 ft. traveling hammerhead crane.

Wis., Antigo—Mattefs Bros., G. Mattefs, Purch. Agt.—rip saws (power).

Wis., Darlington—F. Fiedler—mechanical baking equipment.

Wis., Eau Claire—E. Peterman, 312 Gibson St.—dry cleaning and laundry machinery and equipment for proposed dry cleaning plant on Chippewa Rd.

Wis., Elkhorn—F. J. Schmidt—refrigerating and ice cream making machinery.

Sask., Guernsey—A. Bergen—one barley crisp machine, No. 2.

Wis., Marinette—H. A. White, 2000 Hall Ave.—gas storage tank and pump.

Wis., Milwaukee—The M. B. M. Mfg. Co., 27th and Lake Sts., W. J. Meyer, Purch. Agt.—one or two lathes.

Wis., Milwaukee—The Right Laundry Co., 124 Howell Ave.—belt driven laundry machinery.

Wis., Milwaukee—H. C. Schauer, 1146 25th Ave.—Universal woodworker, electric motor power.

Wis., Milwaukee—M. A. Weinreis, 241 Lake St.—one 10 x 10 x 10 and one 8 x 8 x 8 air compressor, also one 8½ x 9 x 10 d.c. d.d. skeleton hoist and two 7 x 10 d.c. d.d. hoists with boilers.

Ont., Clinton—D. S. Cluff—special machinery nad equipment for cabinet woodworking plant. Estimated cost, $15,000.

Ont., Mitchell—The Wettlaufer Fdry. Co.—modern equipment for proposed foundry.

Ont., Port Arthur—The Provincial Paper Mills, Ltd., A. G. Poundsford, Div. Mgr.—seventy-three book machines capable of turning out 15 ton of book paper per day.

Que., Montreal—The Frontenac Fdry. Co., Ltd., 388 Cartier St.—equipment for new foundry on Lapailleur St.

Metal Working Shops

Conn., Georgetown—Greenwood & Noerr, Archts. and Egrs., 847 Main St., Hartford, are receiving bids for the construction of a 3 story, 52 x 150 ft. addition to plant of Gilbert & Bennett Mfg. Co., manufacturers of wire goods. Estimated cost, $75,000.

Conn., Torrington—The Amer. Brass Co., Waterbury, plans to build a rolling mill on Water St., here. Private plans.

Ill., Chicago—N. Forte & Bros., 2059 Ogden Ave., are receiving bids for the construction of a 1 story, 100 x 124 ft. garage at 251-57 North Crawford Ave. Estimated cost, $50,000. J. T. Fortin, 600 Blue Island St., Archt.

Mass., Whitinsville — The Whitin Machine Wks. is receiving bids for the construction of a 3 story, 75 x 200 ft. garage and fire house at plant. Estimated cost, $150,000. J. D. Leland & Co., 41 Mt. Vernon St., Boston, Archts.

Mass., Whitinsville — The Whitin Ma-Wks. is receiving bids for the construction of a 4 story, 95 x 300 ft. addition to its machinery plant. Estimated cost, $300,000. J. D. Leland Co., 41 Mt. Vernon St., Boston, Archts.

O., Youngstown—The Kalman Co., 42 West Monroe St., Chicago, has had plans prepared for the construction of a 400 x 420 ft. steel fabricating plant (in 3 units), on Poland Ave, here. Estimated cost, $200,000. Private plans.

Pa., Koppel—The Koppel Car Repair Co., subsidiary of the Presses Steel Car Co., Farmers Bldg., Pittsburgh, is receiving bids for the construction of a 1 story, 60 x 500 ft. factory. Private plans.

Pa., Phila.—The city will soon award the contract for the construction of a 100 x 280 ft. office and machine shop on 28th and Cambria Sts. Estimated cost, $75,000. A. E. Davis, City Hall, Engr.

Va., Norfolk—The Atlantic Iron Wks., Water St., plans to rebuild its machine shop and iron works on Southampton Ave., which were destroyed by fire. Estimated loss, $250,000. F. H. Masi, Pres.

Wis., Marinette—T. Klaver, Jr., Archt., 1861 Dunlap St., is receiving bids for the construction of a 1 story, 115 x 117 ft. garage on Court St. for H. A. White, 2000 Hall Ave. Estimated cost, $40,000.

Wis., Racine—W. J. Redden, Archt., 2819 Arlington Ave., is receiving bids for the construction of a 2 story, 80 x 100 ft. garage for the Jacobson Auto Co., 1713 West 6th St. Estimated cost, $45,000. Noted March 9.

Ont., Mitchell—The Wettlaufer Fdry. Co. will build a 70 x 80 ft. addition to its foundry. Estimated cost, $15,000.

General Manufacturing

Ill., Chicago—A. S. Alschuler, Archt., 28 East Jackson Blvd., is receiving bids for the construction of a 6 story, 125 x 125 ft. printing plant on Jackson Blvd. and Laflin St. for the U. S. Sample Co. Estimated cost, $350,000.

Ill., Chicago — F. D. Chase, Archt., 645 North Michigan Ave., is receiving bids for the construction of a 2 story, 150 x 150 ft. factory on Diversey Pkway. near Ashland St. for the Paasche Airbrush Co., 1219 West Washington St. Estimated cost, $50 000.

Ill., Chicago — Newhouse & Bernham, Archts., 4630 Prairie Ave., are receiving bids for the construction of a 2 story, 60 x 170 ft. ice cream factory (1st unit), on Federal and 45th Sts. for the Goodman American Ice Cream Co., 100 West 45th Place. Estimated cost, $75,000. Total cost of project $400,000.

Ill., Rock Island—The Illinois Oil Co., 215 Safe Bldg., will build a 3 story, 40 x 150 ft. office and factory. Estimated cost, $160,000. F. J. Welsh, Pres. Noted March 23.

Mo., East Joplin (Joplin P. O.)—The Wilhoit Oil Co., 718-21 Woodruff Bldg., Springfield, is receiving bids for the construction of a 1 story oil refinery here. Estimated cost, $100,000. Private plans.

O., Utica—The Licking Window Glass Co. plans to rebuild its blowing and packing plant which was destroyed by fire. Estimated loss, $150,000.

Pa., Phila.—J. B. Van Sciver Co., Market St. Ferry, Camden, N. J., manufacturers of furniture, will soon award the contract for the construction of a 7 story, 57 x 61 x 119 x 220 ft. warehouse and factory on Arch St. and Delaware Ave., here. Estimated cost, $600,000. Ballinger Co., 12th and Chestnut Sts., Archts.

Pa., Phila.—Wittman-Moriarity Co., 4th and Vine Sts., has awarded the contract for the construction of a 3 story, 100 x 350 ft. leather factory on Westmoreland and Broad Sts. Estimated cost, $75,000.

R. I., Pawtucket—The Potter Fine Spinners, Inc., Newport Ave., has awarded the contract for the construction of a 2 story, 40 x 75 ft. mill on Newport Ave.

Tenn., Nashville—The Union Ice Cream Co., 817 Broad St., is having plans prepared for the construction of a 3 story ice cream factory on 12th and Broad Sts. Estimated cost, $200,000. Mann & Holman, Stahlman Bldg., Archts.

Tex., Arlington—J. P. King and J. Davis are promoters of a company which has had plans prepared for the construction of a 30 ton ice manufacturing plant. Estimated cost, $40,000.

Wis., Milwaukee — The Interior Woodwork Co., 521 Park St., has awarded the contract for the construction of a 3 story, 67 x 160 ft. and 2 story, 70 x 100 ft. factory and storage plant on Park St. Noted March 9.

Wis., Milwaukee — The Natl. Knitting Co., 905 Clinton St., has awarded the contract for the construction of a 4 story, 40 x 42 ft. manufacturing plant on Clinton St.